DisasterMan

A BIOGRAPHICAL MEMOIR

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RUSSELL C. COILE

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A Biographical Memoir

Russell C. Coile

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To my wife, Ellen Miller Coile

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DisasterMan

Chapter 1
Childhood – 1917 to 1929

I was born on March 11, 1917 in Georgetown University hospital in Washington, D.C. My father was a soldier in the Coast Artillery. Note the word — coast. This meant that we always lived near the ocean or rivers where the Coast Artillery could fire guns at enemy ships. I lived near water from the time I was born until I went off to college.

My father was born on January 4, 1877 on a farm about three miles from Mount Liberty, Ohio. In his twenties he worked at a restaurant in Philadelphia before he enlisted in the U. S. Army at Fort Slocum, New York on April 8, 1907 and was assigned to Company G of the Signal Corps.

At the time of my birth, my father, Master Sergeant Cecil Roy Coile was stationed at Fort Washington, Maryland. This was a coast artillery fort on the Potomac River just across the river from Mount Vernon in Virginia. The fort which was under construction to protect Washington, our capitol had not been completed in 1812 when the British sailed up the Potomac. The unopposed British troops burned the White House and burned the Capitol. The fort was finished a couple of years later and remained an active Army fort until about 1946. It is now a National Park which you can visit.

My father was posted every three or four years to a different Coast Artillery fort. For me, I lived first at Fort Washington, Maryland, then at Fort DuPont, Delaware. Then our family went by ship from the Brooklyn Navy Yard to the Panama Canal Zone for my father's posting to Fort DeLesseps, at the entrance to the Panama Canal on the Atlantic side. That assignment was for three years. We then returned by ship to the Brooklyn Navy Yard for a tour at Fortress Monroe, Virginia across from the entrance to the Chesapeake Bay. A fortress is a fort within a fort — a hexagonal structure with a moat surrounding the fort. There were walls 30-feet thick

where the coast artillery guns or mortars were mounted on top in turrets.

Gunda Christiana Christophersen, my mother, was 17 years old when she came from Oslo to Boston in 1902, according to a Norwegian ship's passenger list on the Internet. Her two older brothers, Olaf Ludvig Christophersen and Oskar Christophersen, had sent her a steerage class steamship ticket which cost them $30. They asked her to keep house for them, cook for them, do their laundry, etc. Their mother had died some years earlier and none of the three of them liked their stepmother.

My two uncles were boilermakers. We would call them machinists in present terminology. They had both completed their apprenticeships in Norway. They didn't stay very long in Boston, however but moved to Washington, D.C. to look for work. They were both hired by a Professor Hollerith who had just established the Hollerith Tabulating Machine Company in the Georgetown area of Washington.

My mother joined the local Baptist church in Georgetown and was active in the Women's Auxiliary. The church was raising funds to support a missionary in Africa. One of the fund raising events was a chicken dinner. Each lady prepared a fried chicken dinner and put everything in a shoebox. The shoeboxes were then sold and the buyer was expected to eat his new dinner with the person who cooked it. This is how my father met my mother. Some months later, he was transferred from Fort Myer, Virginia to Fort Morgan, a Coast Artillery post at Mobile, Alabama. He asked my mother to marry him and she took the train to Mobile and married him there.

My sister was born on March 4, l913 at Fortress Monroe, Virginia. She was named Thelma Christiana. Thelma was a popular name in Norway. I was born four years later. My mother told me once that she named me Russell because she had seen a silent movie that she liked where the hero was named Russell. Russell did not have any Norwegian connection. I have tried to find this movie but have had no luck. I have read that the movie industry started to take off about 1910. There

were about 9,000 movie theaters. Film producing companies began to move to an area named Hollywood which was being annexed by Los Angeles.

My middle name, Cleven does have a Norwegian connection. When my uncle, Olaf Ludvig Christophersen entered the country, the immigration official asked him if he would like to change his name to something more American and less foreign. I have read that between 1890 and 1912 when passports were first issued in the US, more than six million immigrants each year entered the United States. The immigration officials were dealing with lots of foreigners who couldn't read or write or perhaps were Russians using the Cyrillic alphabet which the immigration officials didn't understand. So, the officials often wrote down an American sounding name rather than try to cope with Polish names such as Matujewski, etc.

The officials asked my uncle for the name of the family farm because that was often used as a last name. The farm was named Kleven. In the final outcome my uncle's Norwegian name became O. Louis Cleven. Therefore my name became Russell Cleven Coile.

The Coile in my name is interesting because it is rare. Coyle is a common Irish name similar to Boyle and Doyle. However, all the Coyles that I have ever met have been both Irish and Catholic, and I am neither.

My mother had planned for me to be born in March. She had read a book which recommended would-be mothers that they try to arrange events so that their baby would be born in March. This had the advantage that the mother would be wearing a coat all through the last months of pregnancy during the winter because of cold weather. Furthermore, the baby would be 4 months old in July, the hot month of the year. Remember that there was no air conditioning in those days.

Anyhow, when it was time for me to be born, my mother was being taken by boat up the Potomac to Washington, actually to the port facilities in Georgetown, the head of navigation of

the Potomac River. There are Great Falls and Little Falls just upstream of Georgetown where the Key Bridge crosses the Potomac. I was supposed to be born in Walter Reed Army Hospital on Georgia Avenue in Washington.

However, my mother found out that I was going to be born a little earlier than she had been expecting. Fortunately, Georgetown University's hospital was two blocks from the dock where the boat arrived. My mother was rushed to this hospital instead of the Army one, and I was born soon afterwards. My mother was Norwegian, and brought up Lutheran. She hated being in the Jesuit Georgetown University Hospital with a crucifix hanging on the wall of her room and all the nurses being nuns.

Before World War II the US Army had about 360,000 officers, non-commissioned officers and enlisted men with no women except nurses. All officers and non-coms had quarters on the fort and the enlisted men lived in barracks. The barracks had rows of bunk beds for the soldiers. I lived in quarters on the post all my life until I went off to college. We lived in Army posts in Maryland, Delaware, Panama Canal Zone, Virginia, the island of Oahu in the Territory of Hawaii, and back to Virginia.

Panama

The first house that I remember living in was in Panama. My father was a soldier. He was sent from Fort DuPont, Delaware to Fort DeLesseps, Panama Canal Zone. We sailed from the Brooklyn Navy yard to Cristobal, the port on the Atlantic side of the canal. We stopped for the daylight hours at Port au Prince, Haiti, to unload some US Marines, and their supplies.

My father was a sergeant and was assigned to be in charge of the telephone exchange on the post. I was about five years old and went to kindergarten. My sister Thelma was four years and a week older than I am. The house had two bedrooms, a dining room, a kitchen and a screened in porch. I slept in a bed on the screened-in porch and my sister had the smaller second bedroom. The kitchen had a coal stove. We lived there

for three years and sometimes the post engineer had a bunch of laborers digging a ditch which ran by all the houses. It had a gas pipe, and eventually, someone took away the coal burning kitchen stove and replaced it with a gas stove. I still had to take a bath every Saturday, sitting in a small tub. My mother heated a kettle full of water on the stove – first coal and then gas – to put in my tub.

My father one Christmas gave me a present of a broken electric wattmeter. I carefully placed it near my bed and arranged my transmission lines (string actually) from my pretend power station to a nail I had placed in the wall above my head.

My mother asked the post doctor to write prescriptions for milk for me and my sister. The Canal Zone was US territory until President Jimmy Carter gave it away. The CZ had a small farm with cows but there was only a small supply of milk.

I remember going to a Sunday school camp one summer at the Central Union Church. I spent the entire session making a hammock of strong line. I also learned to swim. Fort DeLesseps was right next to the famous Hotel Washington which had a large swimming pool. A couple years ago I read an article in the *National Geographic* magazine about the Canal Zone and there was a picture of my Hotel Washington.

Fortress Monroe

Fortress Monroe, Virginia, was across from the mouth of the Chesapeake Bay. Norfolk is near the southern entrance to the Bay near Cape Henry, and Cape Charles is at the northern entrance. Fortress Monroe was built about 1817, just after the War of 1812 with England. It was the headquarters of the Coast Artillery and my father taught trigonometry and geometry to enlisted men attending the Coast Artillery School to learn about guns and gunnery.

My father, Cecil Roy Coile is at far right in the front row.

Langley Field was a US Army Air Corps flying field a few miles away from Fort Monroe. Each year there was a contest between the Americans, the British Royal Air Force, and the German, French and Italian air forces. The Schneider Cup Race in 1925 was held in Hampton Roads between the US Naval Air Station at Norfolk, Virginia and the US Army Air Corps Langley Field. I was eight-years-old. My father and I walked down to the waterfront with a picnic lunch and had a good view of the race which was around three markers which formed a triangular pattern. All the planes in the race were seaplanes as the aeronautical engineers designed them for speed because floats had less drag than wheels. A U.S. Army Air Corps Lieutenant Jimmy Doolittle flying a US Navy Curtis R3C biplane seaplane was the winner with a speed of 232 miles per hour. The next day my Father took me to Langley Field so that I could see all of the racing airplanes on display

in front of their hangars since the Americans were hosts for this year's race.

Jimmy Doolittle was a hero for us. In fact he was one of the pioneers in racing aircraft, and the Army sent him to MIT where he studied aeronautical engineering and received both a Masters and a Doctorate degree. He developed instrument flying so that pilots could fly in bad weather and at night when they could not see the ground. When the United States entered World War II after the disaster at Pearl Harbor on December 7, 1941, he became a national hero by organizing and leading an attack on Japan by 16 B-25 medium bombers launched from the U.S. Navy aircraft carrier USS Hornet on April 18, 1942.

When I was about 10 years old, I had a half-dozen friends all about my age who also lived on the post and went to school with me. We had heard and read about trench warfare in France in 1918 in World War I only a few years earlier. We decided that we would dig some trenches. We knew that we would have to be careful and not dig near our houses because each house was surrounded by a grass lawn.

We thought the best solution was to dig somewhere in secret where no one would ever discover our trenches. The ideal place would be in the crawl space underneath an Army office building. For World War I the Army had built temporary buildings to house the expanded Army. These standardized buildings were built of wood and had concrete foundation piers which provided a crawl space almost three feet high. Some were used for offices and others were barracks.

Since our homes were all heated by coal stoves, we each would bring the family's small coal shovel to our secret trench site. We would dig a trench about three feet deep in the sand and about two feet wide. The entrance trench went straight for about 15 feet and then turned 90 degrees. As I remember we went about 10 feet further in that direction and then dug out our headquarters — a square conference room about ten feet on each side.

We tried to be quiet digging our trenches, but we must have laughed too loudly at some point when we were digging in the afternoon after school while the office building was occupied because someone heard us. After searching all over, they discovered the entrance to our trenches. In retrospect, they were very good to us. They told us to take our shovels, go home and never come back again. We were scared at first when we got caught. They explained that they were afraid that we were undermining the foundations. We tried to get them to see that we had been careful in our planning to avoid the foundations. They did tell our fathers about our digging trenches, but they presented it in a friendly fashion. Apparently they found it hilarious that we had built such an elaborate set of trenches and a headquarters with us being only 10-years-old. In fact, most of our fathers felt that we had done a good job learning military history and becoming skilled in the latest tactical doctrine of World War I trench warfare.

When I lived at Fort Monroe, there were two small towns nearby — Phoebus and Hampton. Fishing and crabbing were the main industries of both towns located at the mouth of the Chesapeake Bay. The population of each town was perhaps two-thirds colored. In the 1920s, Negros were called colored — not blacks, not African-Americans — just colored.

At the steamship pier and at the ferry slip at Fort Monroe, there were signs at separate drinking fountains, bathrooms, waiting areas, etc which read "White Only" or "Colored Only." There were separate schools for colored children. Separate but equal was the law. It is strange to think that those practices were all legal for so many years. The U.S. Army was completely white in those days and remained so until President Truman integrated it. Things have certainly changed for the better since those days.

After Lincoln freed the slaves in 1865, a retired Army general established a school for Indians and freed slaves in Hampton, Virginia called the Hampton Institute. About 100 years later the name was changed to Hampton College and later it became Hampton University. My father and mother

knew a teacher there who invited our family frequently to come and have Sunday evening supper at the Institute and then listen to the Institute choir sing spirituals.

My mother and father helped support a colored orphanage with a modest amount of money. In addition, my sister played the piano expertly and I had been taking violin lessons since I was five. At ten or so, I was still terrible. However, Thelma and I would be the Sunday afternoon "entertainment" and would present a 30-minute concert. We were taught that the orphans were good people just like us except they were poorer than we were and because of the law, they had to go to separate schools and drink out of special fountains for coloreds, etc.

The Wright Brothers

The Army had established the Signal Corps in 1860. It was in charge of communications using pigeons, flag signals, the heliograph, and the electric telegraph. Observation balloons were used during the Civil War but not under Signal Corps control. The Bureau of Topographical Engineering was in charge of balloons until 31 March 1862 when they were placed under the Quartermaster Department. Control of the balloons was transferred to the Corps of Engineers on 7 April 1863. The balloon corps was disbanded in June 1863.

The Signal Corps decided in 1892 to organize a new balloon section to accompany each Signal Corps field train. The balloon would be connected by a telegraph cable to the train so that the information from the aerial observer could be telegraphed to the field commanders. Lieutenant William Glassford was sent to France to learn about balloon operations and buy a balloon. After being displayed at the World's Columbian Exposition in Chicago in 1893, the balloon was sent to Fort Riley, Kansas. The next year the balloon was sent to Fort Logan, near Denver, Colorado where Captain Glassford was now Chief Signal Officer of the Department of the Colorado. The balloon was in poor condition and burst upon inflation.

The Signal Corps bought a new silk balloon in 1897 of 14,000 cubic feet capacity, a balloon wagon, four wagons to carry tubes of compressed hydrogen, a service wagon, and

a gas generator and compressor. A balloon shed was built at Fort Logan to prevent deterioration. After the outbreak in April 1898 of the War with Spain the balloon and its equipment were sent to Tampa, Florida and then by ship to Cuba. The balloon was used on 1 July 1898 for reconnaissance during the battle of San Juan Hill. It was badly damaged by gunfire and it was not available for any further battles.

A new Signal Corps post was established at Fort Myer, Virginia across the Potomac River from Washington, D.C, in 1898. A balloon shed was constructed in 1901 and a balloon detachment of twelve men activated in 1902.

The Army's Board of Ordnance and Fortification had given the Smithsonian Institution a grant of $50,000 to develop a flying machine called the "aerodrome." Secretary Langley conducted tests of his machine in October and December 1903 but both times the aerodrome crashed into the Potomac River immediately after being launched.

The Wright brothers had been experimenting with gliders for several years. On 17 December 1903, they flew their flying machine successfully at Kitty Hawk, North Carolina.

On 23 December 1907 the Signal Corps issued a specification for a heavier-than-air flying machine. It was required to carry two persons, travel at least forty miles per hour, and stay aloft for one hour. On 21 January 1908, a specification was issued for a dirigible balloon capable of carrying two persons at a speed of at least twenty miles per hour.

The flying machine trials began on 3 September, 1908 at Fort Myer, Virginia. Private First Class Cecil R. Coile, my father, was one of the eight men of the balloon detachment assigned to assist the Wright brothers launch their aircraft by a catapult. The first flight on 3 September lasted only one minute and eleven seconds, but on 9 September, Orville Wright flew for one hour and two minutes and then took Lieutenant Frank P. Lahm up for a flight of six minutes. On 12 September he flew alone for one hour and fourteen minutes, and then took Major George Squier aloft for nine minutes.

Private First Class Cecil Roy Coile, second from left, helping to pull the Wright Brothers flyer out for a test flight at Fort Myer, Virginia in September 1908.

However, on 17 September, Orville Wright's flight with Lieutenant Thomas E. Selfridge had a mechanical failure aloft. The flying machine crashed killing Lt. Selfridge and breaking Orville's leg and inflicting other injuries. My father was saddened by the loss of his Lieutenant and based on the things he had seen and the marginal mastery of the air the Wright Brothers were able to demonstrate, he decided that, "There is no future in aviation," and transferred out of the balloon detachment and into Coastal Artillery, a series of large guns in forts protecting our harbors and port facilities. Before the end of his life, John Glenn orbited the earth in a space craft and the country was on track to put a man on the moon.

Because of the successful flights prior to the accident, the Wright brother were granted a time extension on the contract trials. The successful tests were carried out a year later in the summer of 1909. This 1909 "military flyer" was displayed in the British Museum for many years because the Smithsonian

Institution insisted that Secretary Langley's aerodrome had been the first machine to fly. In 1946, the Smithsonian apologized to the descendants of the Wright brothers and acknowledged that the Wright brothers had been the first to fly. The 1909 machine was then returned from England and hung in the Smithsonian's Air & Space Museum for many years.

Coile Family Farm

My father was born on the Coile family farm. The 40-acre farm called Red Hill was about 40 miles northwest of Columbus, Ohio on the road between Mount Liberty and Sparta. Ellen, my wife and I took our three children on a vacation in 1969 to visit cousins in Columbus, Westerville, and Yellow Springs and to visit the family farm. Daughter Jennifer was about 15 years old, Jonathan was 12, and Andrew was 8. The farm is no longer owned by a Coile as it had been sold just after World War II. My cousin Doris who lived in Westerville took us to Mount Liberty and the farm and introduced us to the present owner. He welcomed us and was pleased that we had come all the way from Bethesda, Maryland to see the farm. He took us to the family cemetery on the farm so we could see the tombstones of our ancestors. This was a great experience for me as well as for Ellen and our children.

We copied the names and dates on all the tombstones. The oldest Coile was Abraham, my great-great-great-grandfather (born1781-died1845) who was born in the Shenandoah Valley of Virginia. He married Mary Filchmyer (1790-1874.) Abraham moved in 1830 to Morrow County, South Bloomfield Township, Ohio which had been settled in 1813. I have learned that in 1787 part of the Northwest Territory was allocated for homesteads for veterans of the American Revolution. In 1799, some of this became the Ohio Territory and Ohio became a state in 1803. Abraham bought a 160 acre farm, "Red Hill" about three miles from Mount Liberty. The farm was later divided into four parts and the last remaining Coile part was finally sold 100 years later to a Mr. Reinhardt.

Abraham's son, Ruben (1822-1899), my great-great grandfather, also born in Virginia, married Margaret Prosser (1822-1904) whose parents had both been born in Wales in Great Britain. Ruben and Margaret were married in 1845 and had eleven children. They were born in 1846, 1848, 1850, 1851 – Leroy my grandfather, 1853, 1855, 1858, 1860, 1862, 1864, and 1867.

Leroy (1851-1940) married Emma Emerson (1858-1923) and they had two children, my father, Cecil Roy Coile (1877-1963) and Raymond Hilton Coile. Leroy was a plasterer who retired when he was 84 and died when he was 89.

My father and mother had two children, my sister Thelma and me. My father was 86 when he died, and my mother was 89 when she died.

As I mentioned, my great-great grandfather had married someone whose parents had been born in Wales in Great Britain. I am glad to report that I am part Welsh. However it must be a small part of me since I can't really sing and thus I would never be able to participate in an Eisteddfod in Wales. My wife, Ellen was evacuated during World War II to Wales in 1940 when she was ten years old and lived there for more than a year. She learned to read, write, speak, and sing in Welsh. She had to pass an exam in Welsh as part of her Eleven Plus exam which determined whether or not she would go to a college preparatory high school. She is very bright and passed easily and was sent for four years to the Beale Grammar School, a boarding school for girls at Marlow-on-Thames near Henley. Henley is famous for the inter-collegiate races between eight-oar racing shells.

My father grew up on the family farm eating apples and the other food that grew on the farm. His first visit to a dentist was when he was twelve years old. When he died at age 86, the doctor at the Army hospital at Fort Monroe, Virginia told my mother that they would like to put his teeth in the Army's medical museum in Washington, D.C. since he still had all of them and only two with fillings. They thought that it would

be an example of what proper nutrition could do to protect one's teeth.

My father was initially in the Army's Signal Corps but requested a transfer to the Coast Artillery. The headquarters of the Coast Artillery was at Fort Monroe, Virginia.

The Americans entered World War I in 6 April 1917, and my father's regiment was ordered to France. He took the train from Newport News to New York to report to the Brooklyn Navy Yard to depart on a troop ship. But the 1918 flu epidemic came along, and more than 1,000 men in his regiment had to be hospitalized with the flu. So the whole regiment was disbanded and everyone returned home as soon as they were well enough to travel. The Army then never could get the regiment fully staffed with equipment, uniforms, etc. ever again so his regiment never went to France.

After my father graduated from the Enlisted Specialist School he always had technical type assignments. When we lived in the Panama Canal Zone for three years he was in charge of the telephone exchange at Fort DeLesseps in Cristobal at the Atlantic entrance to the canal. When we returned to Fort Monroe after his posting to the Panama Canal Zone, he taught trigonometry and geometry to the soldiers who were attending the Coast Artillery school for gunners. The U.S. Army built Coast Artillery forts around our coasts from the early days after independence from England until 1943. The early forts protected Boston, New York, Baltimore, Washington, DC on the Potomac River, Charleston, South Carolina, Key West Florida, both Atlantic and Pacific entrances to the Panama Canal, Honolulu (Waikiki), Pearl Harbor, Oahu and Manila, Philippines.

When my father was transferred from the Panama Canal Zone to Fortress Monroe, Virginia, I entered the second grade at Phoebus Elementary School. However after only about three months, the town of Phoebus decided that none of the Army children could attend their school since our parents all lived at Fortress Monroe and did not pay any taxes to Virginia. The Commanding General immediately established a school for

us in two wooden World War I former office buildings. The school had four rooms. This was tidewater Virginia where there were only seven grades in elementary school instead of the usual eight grades elsewhere. Our principal was a retired teacher who was very strict and dedicated to teaching us to really learn things. Most of the teachers were either retired or had just graduated from the teacher training college. There were two grades in each room except for first grade. I skipped fifth grade because when I was in fourth grade I heard all the teacher's lectures to the fifth graders. There were seven in our class. I had studied a lot and in seventh grade was selected to be valedictorian at our graduation. I gave my speech on Amundsen, my childhood hero, the Norwegian explorer who had reached the South Pole before the British expedition. He later was lost trying to rescue some Italian explorers whose dirigible had crashed when they were trying to fly over the North Pole. I graduated from elementary school in June 1929 when I was twelve years old.

Hawaii

A few weeks after graduation, we took the train from Newport News, Virginia to New York City. We went by taxi to the Brooklyn Navy Yard to an Army Guest House. We stayed there for three days and then embarked on an Army transport ship. The Army actually had more ships than the Navy in 1929. Most of these ships were passenger liners or cargo ships left over from World War I which had ended in 1918. The Army in those days had three-year assignments to a post with a system of moving families with children from one post to another during the summer months if feasible in order not to disrupt the children during a school year. The Army was very class-conscious. Officers and their families traveled in first-class. Non-commissioned officers such as my master sergeant father and their families were in second-class and the enlisted men were in double deck bunks in dormitories in steerage class. No mixing allowed.

Our ship went from Brooklyn to Panama in eight days with one stop in Port au Prince, Haiti where we had an interesting day sightseeing.

We went through the Panama Canal and then north to San Francisco. The ship stopped for an hour off Nicaragua to pick up an injured U.S. Marine. When we got to San Francisco we stopped for about three days before we headed to Honolulu. Construction on the Golden Gate Bridge had not started so the city skyline looked much different than it does today.

When we got to Hawaii, my father was assigned to Fort Kamehameha, a Coast Artillery post built in 1907 at the entrance to the big Pearl Harbor Naval base. It was time for me to get ready to go to junior high school.

Memories of My Service in the Signal Corps, U.S. Army, By Cecil R. Coile, 1st Lt., AUS (Ret)

My father wrote an article in 1960, 'Memories of my Service in the Signal Corps, U.S. Army.' He submitted it to the Reader's Digest but it was never published.

Memories of my Service in the Signal Corps, U.S.Army
By Cecil R. Coile, 1st Lt., AUS (Ret)

There is a very interesting article in the October 1960 issue of Readers' Digest by Maj. Gen. Benjamin D. Foulois, USAF (Ret) entitled 'And Teach Yourself to Fly.' This article explains in detail all the difficulties of flying the first airplane for the U.S.Army. I can well believe that the flight with Orville Wright was on a windless day. The Wrights were very firm in their resolve that there would be no flights on windy days, even if the President of the United States was a visitor.

I was a member of the balloon detachment on that first day of official flights. I recall one instance during testing when Orville Wright was landing the plane, on wing struck the ground too soon and was damaged. I rushed up and inquired if he was hurt but he was only worried about the damage to the plane.

About this time the Army bought a dirigible balloon with a tent to house it. The Signal Corps detachment and three civilians worked for about three days to erect the tent. In a short time we took the tent down and shipped it to St. Joseph, Missouri for a stock show. By contrast, eight enlisted men erected the tent in a few hours. The secret of this exploit was that the ground was very soft so we could install the 'dead men' to hold the guy ropes in a very short time.

Lt. Foulois and Lt. Lahm were the officers who took care of the flying. One of the disagreeable jobs of the enlisted men was to prevent smoking near the dirigible. As a side issue, I was very much impressed with the fat cattle and the enormous brewery horses who were paraded around with the beer wagons. While we were at the stock show, the word came that Lt. Selfridge had been killed on September 17, 1908 in a crash at Fort Myer.

This accident shocked all of us. The officers remarked that they had been expecting something like this to happen.

At this time I received orders to go to the Coast Artillery's Enlisted Specialist School at Fort Monroe, Virginia. This concluded my service with the Signal Corps. Lt. Lahm inquired if I were not making a mistake in leaving the Signal Corps. I replied that apparently there was no future in the Aviation Section. As it turned out how wrong I was. My friend Pvt. Burge remained with the Corps and had wonderful success.

My service with the Signal Corps started on April 8, 1907. That summer I spent a month at the Jamestown Exposition at Norfolk, Virginia. Our detachment worked with Mr. Israel Ludlow who was an aviation expert. He had been in an airplane crash so he was not able to walk. He had built a plane from bamboo, but so far had made no flights. Our detachment had quite a thrill in assisting him in a flight. Some of the soldiers said it was quite dangerous and they wanted extra pay for that work. It was finally agreed that we should get extra pay. Extra pay would be small return for a life lost. As it happened one man almost lost his life. A Navy torpedo boat pulled our plane which was supported by two whale boats. Our detachment sat in the boats to support the plane if it once got up. The torpedo boat took a run into the wind but the plane did not rise. The boat made a second try but without success, When the pulling effort stopped, the boats filled with water and the whole outfit started to sink. All the men engaged in the effort to fly the plane managed to escape at once except one man who was caught underneath. A civilian who was in the party dived into the water to help him escape, and the soldier came up after a harrowing experience.

In the summer of 1908, my detachment was ordered to St. Louis, Missouri to assist in the World Balloon Race. Our detachment was divided among the foreign balloons. It was interesting to compare the various foreign balloons. For instance the German balloon was very rugged and even the packing boxes were huge and very strong. The French balloon was not too heavy, not too light. As it happened, the German flew the greatest distance, landing in eastern Virginia. It was a beautiful sight as the balloons went up at five minute intervals. As I remember, no two went in the same general direction.

In closing, I wish to remark that when I left the balloon detachment in September 1909, I wished to advance more quickly in the Coast Artillery. As it happened, I rose to the second highest grade in three years.

I shall always be proud of the fact that I was present during the early days of aviation and had the privilege of knowing General Foulois, the Wright brothers, Corporal Burge and all other members of the detachment.

I retired after thirty years service with the grade of First Lieutenant and am now living at 123 Pochin Place, Hampton, Virginia.

(Note: In World War I, my father had been sent to Columbia University by the Army and commissioned as an officer - 2nd Lieutenant in the Coast Artillery Reserves for the duration of the war. After the war he went back to being an enlisted man - a Gunner and then worked his way up through the ranks to become Master Sergeant, the highest enlisted rank.)

Chapter 2
High School – 1929 to 1933

There were several coast artillery forts on the island of Oahu. Hawaii had become a territory in 1898, when some American businessmen staged a phony rebellion and persuaded Queen Liliuokalani to agree to step down and let the U.S. take over all the Hawaiian Islands.

Fort Ruger was on the beach at Waikiki with large gun emplacements for 12 inch artillery guns. Fort Shafter was the headquarters post and had a large Army hospital. The Army had an infantry division at Schofield Barracks in the middle of the island surrounded by pineapple fields. The Army Air Corps was based at a nearby flying field, Wheeler Field, also on the plateau of the middle of the island.

Fort Kamehameha was at the entrance to the naval base at Pearl Harbor. It was about 10 miles west of Honolulu at the end of a road which went through sugar plantations. I went for one year, 1929-1930 to Lincoln Junior High School which faced a large city park. The Hawaiian Academy of Art was on the mountain side of the park and our school was on the side towards Diamond Head.

When the first group of missionaries from Boston arrived in 1820 they converted King Kamehameha to Christianity. Hawaiian folk lore had apparently told them that someone would eventually arrive "to save them from the evil spirits who lived in volcanoes." The missionaries included not only the preacher, but a teacher, a carpenter, a stone mason and a printer. They built a church and a school. After five years the Missionary Society in Boston sent out a second batch of 5 missionaries with the same assortment of skills. They thought that the first group had probably gone native, married Hawaiian women, and had forgotten why they were sent to Hawaii. This assumption was correct. The King approved all these marriages and usually gave the couples a land grant.

This is why the descendents of the first Bostonian missionaries were all millionaires a hundred years later. The Castles, the Cooks, the Baldwins, etc., all sent their children to schools back in Boston — usually including Harvard.

McKinley High School

I entered the 10th grade at McKinley high School in Honolulu in 1930. It was the only public high school on the island of Oahu in the Territory of Hawaii. McKinley High School was established in 1865. When I arrived at McKinley, at that time there were three other high schools on the island of Oahu. Kamehameha School was special in that you had to be Hawaiian or part-Hawaiian to go there. There were lots of part Hawaiian children — Norwegian/Hawaiian children thanks to the crews of the Norwegian whaling ships which had stopped briefly in Hawaii to get fresh drinking water and food, Chinese/Hawaiian children whose Chinese fathers had been persuaded by the Hawaiian sugar planters to come from Canton to work in the sugar cane fields, and so on. Bernice Pauahi Bishop, the last direct descendant of King Kamehameha had left a lot of money in 1887 in her will (the Bishop estate is now worth about ten billion dollars) to endow the school for Hawaiian children. There was a Catholic school for Catholic children, the St. Louis School, and then there was Punahou, an expensive private school.

The Bostonian missionaries had built a school in 1820 called Oahu College. In 1930 it was a private residential school now called Punahou which had all grades including high school grades. Punahou has always been expensive. In the Gold Rush years beginning in 1850 or so, the California gold miners would send their children by sailing ship to Hawaii to attend Oahu College because of the good reputation of the teachers from Boston. California had been Spanish or Mexican for 300 years until 1846 and all the schools in California were taught in Spanish when the gold miners arrived from New York, Baltimore and other East Coast ports. There was a lot of news in the sports pages of newspapers a few years ago about Michele Wie, a Punahou senior who wanted to play

in men's golf tournaments. She wasn't quite good enough to get her foot in the door, but according to the gossip columns she made $10 million in endorsing products in 1966. Another famous Punahou graduate is President Barack Obama who went there on a scholarship.

I decided in high school to become an electrical engineer. We had a marvelous shop teacher who was an amateur radio enthusiast and faculty advisor to the high school's amateur radio club. I had previously thought that I might like to become an architect when I grew up. I tried to design the ideal home and worked up what I thought was an innovative design. I went to the library and ready books about famous architects. Then I decided I should design home number 2. That was an eye opener – I had architect's block, or something. I found it difficult to design a different house – my mind kept comparing the new possible design for house number 2 to my beautiful house number 1 and rejecting the new design. I made the right choice – I didn't have the right temperament or psychological makeup to be an architect where every new design would be different from the previous designs because the new owners were different from the previous owners and would be paying for a design which suited their desires and life styles.

Amateur radio was much more to my liking. It was a challenge to study electricity, antennas, getting to know what all the electrical components of resistors, condensers and vacuum tubes could do and could not do. It was a challenge to avoid getting electrical shocks or even getting killed. There was an old wives tale about jumping a foot for every hundred volts of a shock. Fortunately our shop instructor was very safety conscious and he kept drumming safety, safety, safety into us.

I had previously tried to get interested into model airplanes as a hobby. That was a different scenario. If you didn't build the flying model just right, it would crash. You personally would not get hurt. However, you then had to pick up the

pieces, try to determine what you had done wrong and start over building another model aircraft.

Most of our teachers at McKinley were from the mainland who had been attracted by the lure of living in the tropics rather than teaching in Minnesota, Vermont or some state with lots of snow in the winter. I had wonderful teachers. Our English teachers encouraged us to read and write. We seemed to be always writing papers. They painstakingly corrected our grammar, punctuation and spelling. We had to write brief book-reports on all books we read. I was on the debating team and we used to meet almost every day in a conference room at the Library of Hawaii. My mother would drive from Fort Kamehameha to the University to pick up my sister at 5 o'clock and then come by the library to pick me up. This meant that I was at the library for two hours or so almost every day. I saved my book reviews for the period September 1, 1932 to June 1, 1933 when I graduated. During this time I read 123 books. During the first four months apparently I read 75 books, in the following categories: Fiction 19; Psychology and Philosophy 21; Humor 2; Plays 4; Biography 4; Essays 4; Poetry 2; Religion 2; History 1; Travel 1; and Other non-fiction 15.

I had taken violin lessons from the age of 5 when I lived in the Panama Canal Zone until I was 13 or so when I rebelled at practicing an hour a day. McKinley high school had a big band and a big orchestra. Mr. Paul Sanders, head of the music department was a marvelous musician and teacher. I was happy being one of eight violins rather than playing solo. One year we practiced for months to produce the Gilbert and Sullivan operetta, Pirates of Penzance. I think our production was fantastic. Mr. Sanders had persuaded the football coach to volunteer a group of big linemen to get dressed up in police uniforms. Glorianna Bartholomo had a beautiful soprano voice and was the perfect heroine.

McKinley High's 2,700 students were of different nationalities. A survey in 1932 when I was a student there found 143 different nationalities or mixtures. There were

about 1300 students whose parents were Japanese. There were about 500 Chinese and 200 Filipino students and perhaps fewer than 50 of us from the mainland. My Japanese friends all had to go to Japanese Language School for about three hours every afternoon after our McKinley classes were over. I had one friend, a round eye from the Mainland (we were called "haoles") who lived in Kaimuki where his parents' home was right in the middle of a bunch of homes of Japanese families. The boys he had grown up with invited him to enroll in their Japanese Language School and go with them every day. His parents thought that this was marvelous. My mother was the only round-eye on the PTA Board – the yearbook photo shows the other mothers in kimonos, mu-mus and the Korean national dress.

Japanese people almost always married other Japanese. I only had one Japanese friend, Shigeo Okubo, who married a Chinese girl, Fung Kai. Shigeo was very bright and received a doctorate degree in civil engineering from Johns Hopkins University in Baltimore.

My best friends at McKinley were Jimmy Kagawa, Shigeo Okubo and Katashi Nose. Jimmy's hobby was building model airplanes, the balsa wood flying models with rubber band engines. He became famous and won a local contest for the longest flight. The local newspaper, *The Honolulu Star-Bulletin* paid for him to travel to Detroit, Michigan to participate in a U.S. national contest for flying model airplanes. About 1932 the Department of Education of the Territory of Hawaii built a new public high school in Honolulu because McKinley was getting crowded. The new Roosevelt High School decided to stress English, and announced that all students must come from families where English is spoken in the home. I wanted to stay at McKinley and both my parents agreed, but Jimmy's parents asked him to transfer to Roosevelt because they wanted to enroll his two younger sisters there.

When I returned to Honolulu for my 40th high school reunion, I visited the State of Hawaii Airports Division building lobby to see some newspaper photographs of

Jimmy on his trip to the Nationals in Michigan in a display of aviation history in Hawaii. The caption under Jimmy's picture explained that he was the first person from Hawaii to receive an aeronautical engineering degree from a mainland university. Jimmy received a scholarship to study aeronautical engineering at New York University. Jimmy told me that he was embarrassed to have his picture there alongside a photograph of Lt.Col Onizuka, the only Hawaii-born astronaut who was on the Challenger shuttle. Jimmy was in charge of wind tunnel testing in airplane design at North American Aviation for many years. He kept designing rubber-band powered model airplanes and was the US champion at one time for a flight of 58 minutes inside one of the dirigible hangars at Moffett Field in California. Since he speaks Japanese, he became the manager of the US. model aircraft championship team who were invited to Japan several years for international model airplane contests. He now lives in Corvallis, Oregon where his son teaches at Oregon State. He is still active in amateur radio circles as W6VNN rather than his earlier call of K6KQM.

Katashi Nose, KH6IJ, persuaded me to join our high school amateur radio club in 1931 which had been started by Mr. Laurence Walworth, our shop teacher. I had to learn the Morse code. RCC is dit dat dit, dah dit dah dit, dah dit dah dit. I also had to study radio theory and build my own short wave receiver. This was before the days of the Federal Communications Commission which was established in 1934. The Department of Commerce had a radio division which gave examinations at its office in Honolulu for people who wished to become radio operators aboard ships, or become the engineers at radio broadcasting station, or to become amateur radio operators. I took and passed the exam in 1932 in receiving and sending Morse code, radio theory, and radio laws when I was 14 years old. My amateur radio call sign was K6FVH which I still have today.

Katashi Nose studied physics at the University of Hawaii and then went to Harvard to get his master's degree. He taught physics at Kauai high school for a year and then taught

physics at the University of Hawaii until he retired. He is famous for writing a weekly column on Amateur Radio for the Honolulu Star Bulletin newspaper for more than 50 years. All of his columns are archived at the Library of Congress. He was selected to be the Radio Amateur of the Year in 1983 at the Dayton Hamvention. He died in 1994.

One of the most interesting classes I took at McKinley was the mandatory Junior Reserve Officers Training Corps (ROTC). Lieutenant Samuel Smithers, U.S. Army was our military instructor. I had to take the two years of Army Infantry Junior ROTC at McKinley. I applied for and was accepted for the optional third year of advanced ROTC. I was promoted to Cadet Captain and was the commanding officer of one of the 17 rifle companies. We were issued uniforms, but I was proud of my tailor-made uniforms, which I had paid for out of my earnings. We had to march in formation in the November 11 Armistice Day parade the entire length of Waikiki.

Each of the barracks at Fort Kamehameha had a tailor and the cost of the tailor-made uniforms was very low. I had a job delivering magazines each week to soldiers who lived in the barracks. I would get soldiers to sign up with me and I would deliver a weekly magazine such as the Saturday Evening Post, or a monthly magazine such as Popular Science, or whatever they wanted. My problem was getting them to pay me at the end of the month. There was a payday at the end of each month when the Company's paymaster would pay each soldier in cash. Privates received $21 a month, Privates First Class more, and Corporals still more. There was a small line of people including me near the Paymaster's table. The tailor would be there, the barber, and sometimes ladies (of the evening). We all knew that if we didn't collect what was owed to us that very day, we might have to wait until the next month, because there would be poker gambling that night. The next day, two or three clever gamblers would have most of the money and all the other soldiers in the barracks had practically nothing until the next payday.

I really liked being on the Debating Team. We would work on our presentations for weeks at "our" conference room at the Library of Hawaii. Charles Lum, Blodwyn Lim, and Ah Quon Leong were also on the team.

Charles Lum was a big guy compared to my skinny torso. His father had owned a number of taro fields in the Manoa Valley and was called the "Poi King"(behind his back). The University of Hawaii was expanding and paid him a lot of money for all of his land. Charles posed an ethical problem to us one day. Charles had one older sister, one older brother and two younger sisters. His father was getting on in years, had some health problems, and was making a new will. The problem was this: Charles's father wanted to set some money aside in a special trust for his wife when he died. Then, according to Chinese practice, the eldest son would get everything else and he would decide how much to give to his younger brother (Charles) and how much (if anything) to give to each of his sisters. The Chinese system is based on the concept that girl children will get married and become the responsibility of their new husband. The three daughters were outraged. "We are not living in China, Father," they said. "We are Americans. There are five of us children. You should divide it equally among us." I don't know how it finally turned out but I think Charles's father decided that the Chinese way was best! Charles himself didn't care. He was grateful for his father helping him get a scholarship from the Hawaiian Sugar Planters Association to get him through the University of Hawaii. Charles ended up teaching Agriculture at McKinley High School for many years. He did not become rich but he enjoyed teaching.

Charles had an interesting hobby. The Sandwich Islands, now renamed the Hawaiian Islands, were discovered by Captain James Cook on January 18, 1778. Hawaii planned a big celebration on January 18, 1978. Charles had a tailor make him a costume of a British sailor of the 1778 time period. He would go to elementary schools dressed in his costume and give a lecture on the British discovery of the Sandwich Islands.

I asked him one day as to which grade he preferred to give his lecture to. "The Fourth grade is the best, by far. Earlier than that, they don't seem to be able to understand what I am talking about. The older grades understand, all right, but by the time they are in Sixth grade they are too smart-alecky to even listen and besides, they make fun of me, a Chinese dressed up in a British Sailor's costume."

Blodwyn Lim was my favorite debating pal. She was very clever. I had never heard of anyone named Blodwyn and after I got to know her a little, I asked her how she got the name Blodwyn. She said, "Lots of my Chinese friends in Junior High were starting to call themselves Mary or Elizabeth, or something. One day the thought suddenly struck me – why don't I become Blodwyn? So I decided that a Welsh name which had something to do with white or blessed flowers would be distinctive."

We graduated from McKinley in 1933. Seventeen years later when the Korean War began, I was sent to Oahu in October, 1950. There were four of us civilians and about ten Naval and Marine officers at the Submarine Base at Pearl Harbor in a group called Pacific Fleet Evaluation Group. We would go to Korea for a month to collect data and then return to Hawaii for a month to write our reports. When it was convenient, I would take my friends to meet Blodwyn and invite her out to dinner with us. My friends enjoyed meeting her as I knew they would.

Ah Quon Leong was the smartest one on our debating team. She was a natural rebel, very outspoken and rather radical in her views. She always took the worker's view of any situation rather than the management's side. She went to the University of Hawaii and in 1941 married Bob McElrath, a union organizer for the International Longshore and Warehouse Union.

Things have changed since those days. Harry Bridges, Bob McElrath's boss as President of the International Longshore and Warehouse Union who worked in the port of San Francisco wanted to marry a Japanese lady.

Bridges met Noriko Sawada during a fund-raiser for Mine, Mill, and Smelter workers. In 1958, the couple decided to marry and went to Reno, Nevada for their marriage license. However, at that time Nevada had a law banning marriage between any white person and, "…any person of the Ethiopian or black race, Malay or brown race, Mongolian or yellow race, or American Indian, or red race." At the county courthouse, the clerk refused to give the couple a marriage license on account of Ms. Sawada's race being "yellow." Bridges and Sawada then sought a court order from the District Judge for issuance of the marriage license. The Judge granted the order, in direct contradiction to the law, and the couple married December 10, 1958. This order prompted the Nevada legislature to repeal all anti-miscegenation laws in the State on March 17, 1959. In 1967, the U.S. Supreme Court declared all such anti-miscegenation laws to be unconstitutional. There is an interesting oral history of my debating team-member Ah Quon McElrath (neé Leong) on the Internet.

Be Prepared is the Boy Scout motto. When I was a child, although we would never like to admit that we were actually children in those days, being one of the Boy Scouts of America was an important part of my life.

We wore Scout uniforms and we were organized into patrols. I was delighted to be assigned to the Wolf Patrol. We had weekly meetings. The meetings had a structure: pledge of allegiance to the flag; reciting the Boy Scout Creed in unison; each Scout then reporting on "good turns" by telling the rest of the troop about each good turn we had done during the week, such as helping an old lady across the street or carrying bags of groceries into the house from a car driven by an elderly gentleman, and so on.

We had to study and pass exams in order to progress from Tenderfoot to Second Class and then more studies and demonstration of skills to progress from Second Class to First Class. We had to learn all sorts of useful survival skills. We learned what to take on a camping trip and more importantly, what not to take. We learned how to pack a knapsack, how

to pitch a tent, how to dig drainage ditches to carry off the rainwater so that water didn't come inside the tent. We learned how to tie a dozen or so different knots. We learned how to tie a square knot and not a granny knot. We learned how to tie knots in the dark. We would be blindfolded and have to tie a bowline which would never slip and could be used to lower people out of buildings. We learned how to tie knots in ten seconds or fewer. We loved the clove hitch because when you put it on a post, the harder you pulled the tighter it became.

Our Scoutmaster back at Fort Monroe, Virginia took us all horseback riding and taught us how to groom our horse, put on a bridle and saddle. We learned how to tie a diamond hitch to attach loads to a pack horse. All Army posts in those days (the 1920s) had horses. An officer's uniform included boots and spurs and not just for the cavalry officers. Infantry officers rode horses while the enlisted men marched. Field artillery officers rode horses while enlisted men drove the horses hitched to the caisson as the "caissons go rolling along."

Thirty years later, some Secretary of Defense issued an order that all post stables on Army posts would be closed down and the horses sold to economize. All officers and men would ride in the future in jeeps. The horse cavalry had been converted to tanks. At that time I was working as a civilian scientist at the U.S. Marine Corps base in Quantico, Virginia. The Marines had a large post stables because a number of senior Marine officers including a few generals at US Marine Corps Headquarters in Arlington, Virginia 30 miles away had show jumping or polo as hobbies. There were a number of beautiful show jumping horses at Quantico for their use. The U.S. Marines didn't like this order but there was nothing for them to do except say "Yes, sir." They took down the sign that said "Post Stables" one day and replaced it the next day with a new sign, "Animal Management Training Facility." They did not sell a single show jumping horse. Since all horses were now designated pack-horses they wrote an article for the local paper explaining how all these pack horses were being trained to carry ammunition and the young officers attending

the Officers Basic School were now getting training in loading pack horses and how to tie the diamond hitch.

It was exciting to be a Boy Scout. I enjoyed learning things such as first aid, how to build a campfire, how to cook one's dinner, how to track wild animals, how to ride a horse, how to fire a rifle, how to be a team member of the Wolf patrol and so on. I even enjoyed going to church in uniform with all of my friends in the Boy Scouts.

The most exciting events to a 13-year-old are those when one wonders why one is participating in a survival-type activity. One of our camping trips on Oahu will stick in my memory forever. I enjoyed the preparations on a Friday night for an early departure on Saturday morning. I packed my knapsack with anticipation for a relatively short hike up into the mountains, pitching a tent, cooking dinner and then a relatively easy downhill hike to return home on Sunday.

Our scoutmaster explained the route planned for the hike. The tropical forest vegetation was so thick and impenetrable that he decided we would basically hike up a stream bed since we were not allowed to use machetes to cut our way through the jungle. Each patrol took a turn in leading the hike. We rotated positions each hour on the hour with a ten minute break to rest. I did not like the way the weather was worsening. It started out sunny, then changed to cloudy, then showers came, and then heavy rain. In fact it rained constantly all day Saturday and all day Sunday until we arrived at home. I have never been so wet. I'm glad that we were hiking on the island of Oahu. The rainfall on Kauai, the garden island, has been reported to have been more than 400 inches each year for most years.

With my mother on graduation day from McKinley High School, Honolulu, Hawaii, June 1933.

When I graduated from high school I was only16-years-old. I could not apply to Ivy League colleges, such as Princeton which required incoming students to be at least 17-years-old. I had won an award at McKinley high school presented by the Harvard Club of Hawaii to the outstanding member of the junior class. However I could not apply to Harvard for two reasons: I was not 17 and I had only taken two years of Latin instead of the three years of Latin required by Harvard.

There is a very active Alumni Association for McKinley High School. I managed to get back to Hawaii in 1978 for my 45th Reunion at the Cannon Club at Fort Ruger.

I also managed to get back in 1993 for my 60th Reunion at the Hale Koa Hotel. By this time, lots of my classmates had died or moved away or something. The Reunion committee had us assigned to tables seating ten and to my dismay I did not know or remember any of the nine people at table # 4, my table. That problem was solved by Blodwyn (who was on the committee) who found a spare seat at table #13 where I could sit beside her.

In 1986, the faculty and alumni formalized and implemented a "Hall of Honor" to recognize McKinley's outstanding alumni who brought honor to the school and community through their achievements and contributions. The Hall now has numerous photographs including one Governor (Governor Samuel King), two US Senators (Senator Daniel Inounye and Senator Hiram Fong), one Sheriff/Olympic swimmer ("Duke" Kahanamoku). There were about 900 in our class of 1933. Six of my classmates are included in the Hall of Honor. Ah Quon Leong McElrath (Community Activist/Labor Leader); Harry Chuck; Teichiro Horita (Superintendent of Education for the Territory); our class president, Lionel Camara (Tax Collector); Seido Ogawa, who won every public speaking/oratory contest (minister); and our Jr. ROTC Cadet Colonel who became Major General Robert Louis Stevenson (Adjutant General, Hawaii National Guard).

I really enjoyed my high school days. I was promoted to be an officer in our Junior ROTC unit. I played violin in the orchestra. I was President of the McKinley Citizenship Club which did useful things such as organizing "clean-up" days where we would pick up trash all over the campus and pull up weeds in the lawns and that sort of thing. There was a corresponding Girls organization which twisted our arms to attend dancing lessons. They paid professional instructors to teach us ballroom dancing since there was a monthly student dance on a Friday afternoon, plus the Senior Prom, of course. I enjoyed being on our debating team with my friends. I made model airplanes. I built a small amateur radio station next to my study desk at home. My parents were very strict about my doing all my homework before I could put on my earphones and listen to amateur radio stations. I earned money for my hobbies by my magazine delivery business to soldiers in the barracks.

When my father transferred out of Hawaii, we went back on a troop ship to San Francisco. I picked up mumps on the trip so I was put in quarantine for two weeks after we arrived in the Army's old Letterman General Hospital at the Presidio

of San Francisco. My hospital room had a splendid view of Crissy Airfield. I enjoyed watching the planes take off and land. In 2007, my grandson Zachary proposed to his wife Dianne at Crissy Field, converted to parkland after the Army closed the base in 1994.

My parents leaving Honolulu for their next duty station at Fort Monroe, via San Francisco in the summer of 1933.

Book Reports by Russell C. Coile while at McKinley High School, Honolulu, Territory of Hawaii

Betrand Russell, *The Scientific Outlook*
Begun: September 22, 1932; Finished: September 24, 1932

What I think of this book: This book was far over my head in quite a few places but the author's style is very delightful to read. I think a book like this now and then is of great help in getting your mind to really work since the ordinary run of fiction is quite easy. Borrowed from: Library of Hawaii.

A.L. Merrill, *Life of Queen Victoria*
Begun: October 1, 1932; Finished: October 8, 1932

What I think of this book: This book is very dry. I think that if anyone wishes to test their will-power, here is the opportunity. If they can read this whole book and really enjoy it, I take off my hat to them. The author goes into very great detail, i.e. the queen is on her death-bed for 2 days but this occupies 54 pages. Borrowed from: a friend.

Helen Hathaway, *What Your Voice Reveals*
Begun: October 21, 1932; Finished: October 21, 1932

What I think of this book: This is a short book stressing the importance of voice culture. 'Now with the advent of the radio and the 'talkies,' America is becoming voice-conscious,' stated the author. This book gave several exercises for improving the voice and stressed the use of correct pronunciation. Borrowed from: Library of Hawaii.

F. S. C. Northrop, *Science & First Principles*
Begun: October 25, 1932; Finished: October 30, 1932

What I think of this book: This book was much too deep for me. It was supposed to be written for the 'layman' but that didn't seem to help me much. I am sorry I do not have the time to study this book as it is very complete and would do me a lot of good.
Borrowed from: Library of Hawaii.

Raymond D. Little, *Tennis Tactics*
Begun: October 24, 1932; Finished: October 25, 1932

What I think of this book: I read this book because I have a friend who is always beating me at tennis, and what is worse, boasting about it. I wanted to take him down a peg or two so when I saw this book I was glad that I had this opportunity to improve myself. Borrowed from: Library of Hawaii.

Leta S. Hollingworth, *Psychology of the Adolescent*
Begun: October 28, 1932; Finished: October 28, 1932

What I think of this book: This was a very interesting book for me at least. It explained many things that I had wondered about, e.g. the change in my attitude towards girls, etc. I think that this would prove interesting to anyone who reads it. Personally, I liked it. Borrowed from: Library of Hawaii.

Joseph Conrad, *The Rescue*
Begun: November 4, 1932; Finished: November 6, 1932

What I think of this book: I was quite disappointed in this book. It had a very high recommendation but I didn't like it very much. It started out all right at first, with good descriptions but my interest petered out after the 4th chapter. I don't like books of this type as a rule. Recommended by: an English teacher. Borrowed from: Library of Hawaii.

Stanwood Cobb, *Discovering the Genius Within You*
Begun: November 15, 1932; Finished: November 17, 1932

What I think of this book: When my sister saw me reading this book she said, 'Don't get egotistical,' but I think a book like this good for a person, once in a while. Sometimes I get moody and a book of this type is helpful in pulling you out of the dumps. I liked this book very much. Borrowed from: Library of Hawaii.

Oswald Kendall, *The Missing Island*
Begun: November 24, 1932; Finished: November 24, 1932

What I think of this book: This is a quite mediocre book. After I finished it I was sorry I had read it for it didn't do me any good, it didn't make me work, and it didn't amuse me very much. I don't recommend it to anyone, but some may like it.
Borrowed from: Library of Hawaii.

Joseph Conrad, *Youth*
Begun: December 3, 1932; Finished: December 4, 1932

What I think of this book: I have the same criticism to make of this as I have on Page 3. [*The Rescue*] I was quite disappointed in this book, too. Miss Neill thought I might like this, but I didn't care for it at all. I don't know why, but I just dislike a book of this type. Recommended by: an English teacher. Borrowed from: Library of Hawaii.

Countee Cullen, *Caroling Dusk*
Begun: December 4, 1932; Finished: December 8, 1932

What I think of this book: This is an anthology of verse by Negro poets, edited by Countée Cullen. This is the first book of poetry I have ever read but I enjoyed it very much more than I thought I would. The biographies of each poet make it the more interesting. Recommended by: my sister. Borrowed from: Library of Hawaii.

William Shakespeare, *Hamlet*
Begun: December 13, 1932; Finished: December 16, 1932

What I think of this book: This edition was a very good one. It was edited by Joseph Quincy Adams and has a commentary which is excellent. I enjoyed the commentary almost as much as the play. It explained everything in a very good style. I liked 'Hamlet.' Borrowed from: My sister.

Louis Untermeyer, *Modern American Poetry*
Begun: December 17, 1932; Finished: December 24, 1932

What I think of this book: My sister once told me that the reason I didn't like poetry was because I hadn't read enough. After reading this 800 page collection however, I have changed my mind. I see where poetry is the 'rhythmic creation of beauty' as Walt Whitman said. This is a very good collection. Borrowed from: Library of Hawaii.

Laura Haddock, *Steps Upward in Personality*
Begun: December 19, 1932; Finished: December 19, 1932

What I think of this book: This is one of the best books I have read for a long time. It has many quotations and poems that apply to the different subjects. If I could only live up to most of the ideals set forth here, I wouldn't have anything to worry about. Borrowed from: Library of Hawaii.

Samuel Smiles, *Character*
Begun: December 23, 1932; Finished: December 25, 1932

What I think of this book: The chaplain of the church I go to gave me this book to read. It was written about 1880 so it is rather old and dry. It is rather long too. Still it will do anyone good to read this book for character is analyzed very completely. Recommended by and borrowed from: a friend.

George Worts, *The Phantom President*
Begun: December 29, 1932; Finished: December 29, 1932

What I think of this book: This is another book not worth reading. It tells of a millionaire who was very reserved and desiring to be President of the U.S. he hires a soldier of fortune who resembles him to portray his human side to the public. After he gets elected many complications follow. Borrowed from: Fort Kamehameha Library.

Jack Lait, *The Big House*
Begun: December 30, 1932; Finished: December 30, 1932

What I think of this book: I hadn't been to a movie for over two years so I read this book to see if they were really as bad as I thought they were. If there are many more shows like this, I certainly haven't missed anything! This book is utter trash. I am almost ashamed that I read it.
Borrowed from: Fort Kamehameha Library.

Robert Browning, *Robert Browning's Poems*
Begun: January 6, 1933; Finished: January 7, 1933

What I think of this book: This was a very dry book for me. I didn't like most of the poems. Perhaps the fault is in the reader and not the writer, but these poems didn't appeal to me at all. I like Untermeyer's collection 'Modern American Poetry' much better. Browning may be a good poet, but not to me. Borrowed from: a friend.

Teacher's comment: Did you understand his poems?

Kathleen Norris, *Storm House*
Begun: January 13, 1933; Finished: January 13, 1933

What I think of this book: I didn't care much for this book. I remember reading it 3 or 4 years ago but I didn't like it then, either. I think it gets too sentimental at times to be true. And I don't think that people would act this

way normally. Her characters aren't natural at times. Borrowed from: Fort Kamehameha Library.

Edwin C. Slosson, *Creative Chemistry*
Begun: January 13, 1933; Finished: January 13, 1933

What I think of this book: This is an excellent book. I didn't think that Chemistry was so interesting. The author explains very clearly the importance and use of Chemistry in our lives. This is one of the most interesting scientific books I have read.
Borrowed from: Fort Kamehameha Library.

Countee Cullen, *Color*
Begun: January 13, 1933; Finished: January 13, 1933

What I think of this book: This is a book of poetry by that famous negro poet, Cullen. I like this book. The more I read of poetry the more I like it. I don't know why I disliked Browning's poems and like this book though. For a good book of poetry, I recommend this to anyone. Borrowed from: Library of Hawaii.

Bertrand Russell, *What I Believe*
Begun: February 13, 1933; Finished: February 13, 1933

What I think of this book: This is a very short book by Russell giving his beliefs. I was interested in reading this book since I read a chapter in the book 'Living Philosophies' written by him and again I read about him in Will Durant's 'Story of Philosophy.' I only wish I could understand more of this. Borrowed from: Library of Hawaii.

S. M. Shellow, *How to Develop Your Personality*
Begun: March 1, 1933; Finished: March 3, 1933

What I think of this book: Perhaps you may think I am very egotistical and foolish to read a book of this type, but I assure you, on the contrary, this is a book on psychology; not some correspondence course which I saw advertised in 'Amazing Stories.' This was a very helpful book. Borrowed from: Library of Hawaii.

Robert C. Rogers, *How to be Interesting*
Begun: March 14, 1933; Finished: March 14, 1933

What I think of this book: This book I believe was written sort of for salesmen, etc. I found it quite nice. The secret of being interesting, the author said, was to be interested. Much other helpful advice is also given. It will do everyone good to read a book of this type once in a while. Borrowed from: Library of Hawaii.

Oliver Goldsmith, *Vicar of Wakefield*
Begun: March 20, 1933; Finished: March 20, 1933

What I think of this book: I did not care for this so much. It must be a good novel to have come down through the years as it has, but I didn't enjoy it very much. It seems sort of too sentimental at times. I don't care for such senile optimism either. Borrowed from: a friend.

Teacher's comment: Remember the age in which it was written!

Albert M. Treynor, *Hawk of the Desert*
Begun: April 12, 1933; Finished: April 12, 1933

What I think of this book: I borrowed this book from an army library. This is about the average type of book found there. It was just a waste of time to read this book. It is just so much trash. I probably would have enjoyed this two or three years ago, but I didn't care for it now. Borrowed from: Fort Kamehameha Library.

John Bunyan, *Pilgrim's Progress*
Begun: May 3, 1933; Finished: May 3, 1933

What I think of this book: I didn't get very much out of this book. It may have been very effective in the age in which it was written, but at my age it did not interest me very much. Perhaps I may like it more when I am older but at present it seems sort of dry. Borrowed from: Library of Hawaii.

Joseph Conrad, *The Rover*
Begun: May 16, 1933; Finished; May 17, 1933

What I think of this book: This book is nothing to get excited about. Borrowed from: Library of Hawaii.

Chapter 3
College Years – 1933 to 1939

University of Maryland

Because students had to be 17 years old to enroll at MIT, my parents decided that I should attend the University of Maryland for a year and grow up. My Uncle Louis Cleven lived at 610 9th Street, NE in Washington DC and I could take the electric street car from College Park about eight miles away to come and stay most weekends with him. My mother felt that I might not get proper food in the College cafeteria, and Aunt Hetty would feed me a good Sunday dinner. I lived in a dormitory on the College Park campus and had a marvelous time. I became the secretary of the University's amateur radio club. The club had a small room in the attic of one of the buildings with classrooms and I spent lots of evenings there after I had finished my homework. The call sign was W3EJK. Since I did nothing but study, I got good grades. In fact all were A except for one B.

The University of Maryland had a big emphasis on agricultural courses. The University had several farms and a lot of research projects coordinated with the U.S. Department of Agriculture's experimental farms at nearby Beltsville. One of the benefits of the University's agricultural courses was a farm products shop at College Park right on Route 1 that was famous for selling ice-cream to passing motorists (and to us students). Iowa State, Penn State and other colleges such as Texas Agricultural and Mechanical had old fashioned courses for engineering students. George Washington had been a land surveyor, so all of us engineering students had to take a course in surveying. It didn't make sense to those of us who were studying electrical engineering or chemical engineering to waste our time learning how to survey. However I enjoyed the practical courses. We had woodworking shop to learn how to make patterns of tools or what ever we might need.

Then we had foundry to use the pattern to cast something such as a chisel. Finally we had metal working shop to finally finish the tool.

The President of the University of Maryland was a former football coach who had given football scholarships to a number of husky coal-miner type athletes from Pennsylvania. For two consecutive years, the Maryland Diamondbacks (now known as the Terrapins — a name they adopted the year I attended College Park) were Number One in the nation in college football. The President exploited this publicity by going to the state capitol in Annapolis and requesting millions of dollars to expand College Park and build more classrooms, dormitories and all sorts of buildings and especially a new football stadium. The legislature gave him all the millions he asked for. Unfortunately, the President was a more than 100 percent patriotic American. He insisted that all University employees including instructors and professors sign a loyalty oath. All students had to take a mandatory course in Americanism. A number of the professors resigned in protest and the others persuaded the Board of Regents to fire the President and replace him with a more academically qualified person. Since the glorious football days were over, he was replaced.

Hollerith Tabulating Machine Company

My Uncle Louis was an inventor. He invented machinery to punch cards — the cards we call IBM cards. But let me tell you something about my uncle and why I thought of him as the most wonderful uncle in the world. My Uncle Louis (Olaf Ludvig Kleven) was born and brought up in Norway. Louis and my uncle Oskar came to Boston about 1901. Then the two brothers decided to move to Washington, D.C to look for jobs that paid more money. They both were hired by Professor Herman Hollerith, a Columbia University professor who had invented a tabulating machine when he was an instructor at MIT. He now had a small business called Hollerith Tabulating Machine Company in the Georgetown area of Washington, D.C. It was on the Chesapeake and Ohio Canal about 34th Street, N.W.

The 1890 census had taken nine years to tabulate all the data with hundreds of clerks with inkwells going one, two, three, four, five across, etc. Professor Hollerith taught physics at the Massachusetts Institute of Technology for two years before he moved to Columbia in New York City. While at M.I.T. he came up with the idea of using cards with holes punched in them to tabulate things. The correct arrangement of holes could spell names or numbers. He applied for and was granted two patents for his punched card system.

Professor Hollerith got a contract from the Census Bureau to tabulate the 1900 census within six months. Actually, it only took four months. The Census Bureau thought that people wouldn't believe these numbers compared with the nine years the previous census tabulation had taken, and asked him to tabulate it all over again to see if the machines gave the same answer – which they did.

After successfully completing the census contract, Prof. Hollerith decided to sell his Hollerith Tabulating Machine Company and return to teaching at Columbia University. He sold the company to his salesman — Thomas J. Watson. My two uncles did not like this salesman who was full of dreams. Mr. Watson immediately changed the name of the company to the grandiose title of International Business Machines (IBM). My uncles thought he was just an impractical salesman full of dreams and quit. They were both immediately hired by the new National Bureau of Standards, established in 1901, which had been asked by the Census Bureau to build tabulating machines for them. Watson's new IBM Company started out with a policy of never selling machines, just renting them. The Census Bureau thought IBM was too greedy with high monthly rents.

Uncle Louis transferred to the Census Bureau from the Bureau of Standards when the Census Bureau got Congress to approve its budget to build its own government-owned tabulating machines. He stayed there for the next 30 years, designing, inventing and patenting punched card machines.

He eventually was assigned a Department of Justice lawyer to prepare all of his patent applications.

Massachusetts Institute of Technology (MIT)

When I became 17-years-old, after a year at the University of Maryland I received a scholarship to enter MIT in September, 1934. There were about 500 in our Class of '38. MIT required all freshmen to live in student dormitories unless they lived at home within commuting distance by bus. Each person in the dorm had his own room to be sure he studied and did his homework. We were not allowed to own a car. The dorms were walking distance from the main library and Walker Memorial, the Student Union which had a cafeteria, music rooms, bowling alleys, ping pong tables, a large ballroom for weekly dances, etc.

As a transfer student, I received credit for my first year of Army ROTC at the University of Maryland. Army ROTC was mandatory for two years at all land-grant colleges such as Maryland so I had taken Infantry ROTC with all the other freshmen. I also received credit for freshman English and freshman Chemistry. In effect, I had to start over as a freshman at MIT. MIT was much more advanced than the land-grant colleges. All freshmen at MIT had to study calculus and physics using calculus. At the University of Maryland these courses were considered too difficult for freshmen and were given in the second year.

MIT had another interesting requirement. For the first two years everyone either had to go out for a sport or go to exercise classes. There were about 30 different sports. No football, basketball or baseball since MIT considered these sports too commercial for a college. Crew was the big sport in New England. The winning crew in New England would go to England to compete against Oxford and Cambridge University crews at Henley. Golf, tennis, volley ball, track and field sports, wrestling, other Olympic sports such as fencing, lacrosse, bowling, swimming, ice hockey, etc. In 1936 a business School professor who was a sailor raised $100,000 to start a sailing program at MIT. He asked a Naval

Architecture professor to design a 12 foot sailing dinghy – the "Tech Dinghy." Then he gave a contract to Hirschhoff in Rhode Island to build 40 Tech dinghies in wood. Finally, he asked an Architecture professor to design a "Sailing Pavilion" which was built on the Charles River in front of MIT. The 40 dinghies were stored in racks upside down and there were storage areas for sails and masts plus workshops for repairs of minor damage to the boats.

Almost 1,000 people signed up for sailing. They were in for a surprise. Before they got introductory lessons in how to sail the new 12 and ½ foot Tech Dinghies, they all had to attend ground school classes, learn to tie 27 different knots so they knew what a stunsail tack bend was, how and when to tie a clove hitch, plus the names of all the sails of a three-masted square rigged ship.

I had some interesting classmates. One was Cornelius Van Schact Roosevelt, grandson of President Theodore Roosevelt. Corney studied mining engineering and went to the Philippines after he graduated and made a lot of money in mining. He was an officer in the US Navy and in OSS during the War. According to his obit in the Technology Review he lived in the Watergate Condo after the war and was in charge at the CIA in developing special James Bond type devices and listening gear for our intelligence war with the Soviet Union. It was all super hush hush. Somehow he became interested in Escher, the Dutch artist. He would fly to Holland and commission Escher to do things. He also built up the largest private collection of original Escher drawings in the world. The National Gallery of Art had a special Escher exhibition for six months during 1979 and two thirds of the Eschers were property of Corney loaned to the Gallery for the exhibition.

Jennifer had a friend, Mary Ossi, an architect who lived in Mexico for a year. Jennifer's other friend Graceanne who married an anthropology professor at the University of Maryland used to visit the Oaxacan region every year for over ten years. Jennifer visited her several times and even took Doreen there in about 1978. Somehow the Indians started

weaving Escher design images. Jennifer bought three rugs for us. I liked two of them which are now hanging on the wall of our breakfast nook in the kitchen. I didn't like the third one so we packed it up and sent it to Corny. He wrote us immediately to thank us. He was delighted. I was surprised.

Another interesting thing about being a student at MIT during the depression was the opportunity to earn money. Beginning with my second year in Cambridge I had part time jobs. The Government had a program of grants for university professors to hire students to do calculations for their research projects. I became a calculator for two years for one of the electrical engineering professors who invented wave guides for microwave transmission. He was a one-man army competing with the Bell Telephone Labs. I don't remember who won in the contest to get the first patent.

In my senior year I saw a notice on the EE bulletin board looking for someone to draw all the technical illustrations in a book. They gave each applicant a bunch of rough illustrations which we had to turn into the finished drawings before noon the following day. It was a diabolic task since it would normally take about 3 days to do all of them. I stayed up most of the night to finish all of them and got the job "because I drew the best looking arrows."

Tuition was $400 a year at MIT in those years. Tuition at Harvard was $500 so some Harvard students transferred to MIT to save $100. At the time, my father was a master sergeant who received a house, a ration (food) allowance since he was not living and eating in the barracks, a uniform allowance but it only added up to only $163 a month in cash. Privates received $21 a month. I tried to spend $1 per day to eat in the cafeteria.

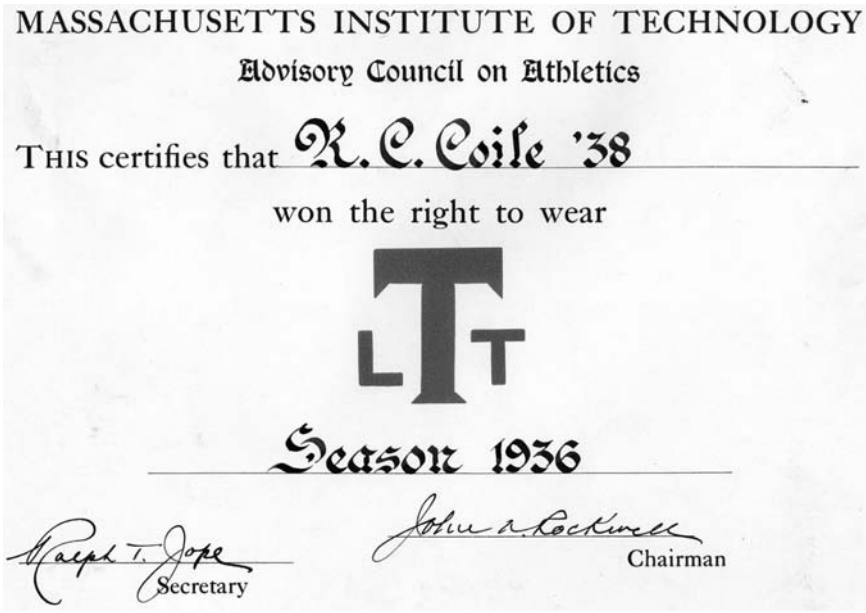
We were on a three semester system. One summer I was at a study semester in Cambridge. Sitting next to me in a Strength of Materials class was Richard Collins, a big 200-pound colored man who had graduated from the Hampton Institute in Virginia. I helped Richard with his homework and he said he would like to teach me how to row. He had been on the

crew at Hampton. We would go out in a two man workboat and he would patiently try to teach me the fundamentals of rowing. We must have looked ridiculous – I was a scrawny thin white bean pole and he was 200 pounds of all muscle and black as black can be.

During World War II I carpooled for many months to the Pentagon with Richard Hazeltine who had been on the MIT varsity crew. He persuaded me to join the Potomac Boat Club right next to Key Bridge. I was there one day for my usual time in a single workboat wherry when the alumni of the University of Washington in Seattle asked me to help them. One of their regular alumni crew was sick and they needed "someone who could row" to take his place. I tried to explain that I had only rowed in a two man boat but they were desperate and persuaded me to fill in. I nearly died trying to keep up with them and not catch any crab trap buoys. Wow, never again for little old me.

Varsity Athletics

I signed up for track for the fall semester and ran in 880 yard relay events. I won my 1938 class numerals in internal MIT meets. I really ran in the winter to get in condition to play lacrosse in the spring semester, since a lacrosse field is much longer than a football field because you can play behind the goals. When the coach (a Harvard graduate student) heard that I had transferred from the University of Maryland, he immediately put me on the team, since the Johns Hopkins lacrosse team had been number one in the nation for years. Apparently he assumed that anyone from Maryland had been brought up playing lacrosse since early childhood. Many New England colleges had their entire football team play lacrosse in the spring just to get in better running condition for the fall football season. MIT would have four or five spare players for replacements in contrast to their coach sending in a complete spare replacement team. So I really earned my letter "T" for varsity lacrosse.


MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Advisory Council on Athletics

THIS certifies that R. C. Coile '38

won the right to wear

L T

Season 1936

Ralph T. Jope
Secretary

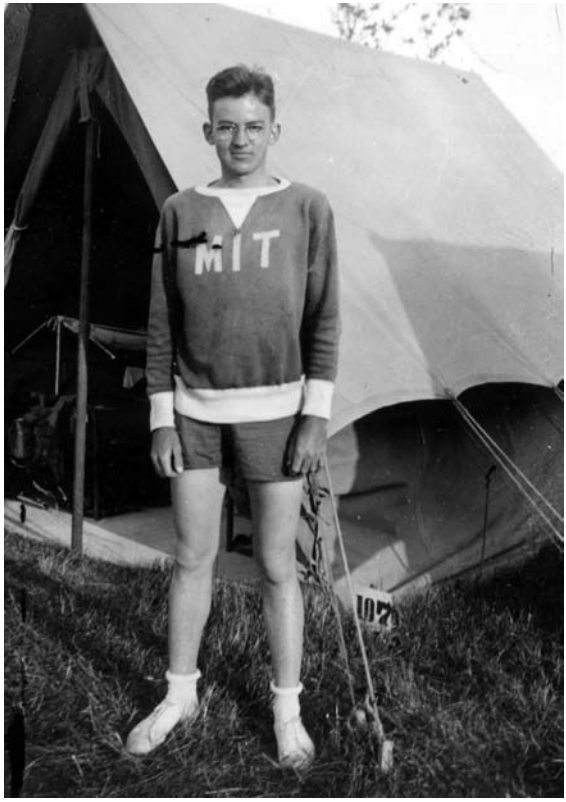
John A. Lockwell
Chairman

Varsity Letter for Lacrosse.

ROTC

MIT had two years of compulsory Army ROTC for all physically fit male students. Then students could apply for the optional two years of advanced ROTC. If they were accepted they would be commissioned as 2nd Lieutenants in the United States Army Reserve at graduation. MIT did not have Infantry ROTC but only technical branches, such as Ordnance, Signal Corps, Corps of Engineers, and Coast Artillery. The Military Science Department had six Army officers. The department head was a Lieutenant Colonel, Associate Professor of Military Science and Tactics. The Coast Artillery Unit had a Lieutenant Colonel and a Major, Coast Artillery as Associate Professors. The Ordnance Unit had a Major, Ordnance Department, Associate Professor. The Signal Corps Unit had a Major, Signal Corps, Associate Professor, and the Engineer Unit had a Captain, Corps of Engineers as Assistant Professor.

I was studying electrical engineering in Course VI-A so I was automatically enrolled in the Signal Corps Unit. The students studying physics, Course VIII, and mathematics, Course XVIII were also in the Signal Corps Unit. Our Associate Professor of Military Science and Tactics was Major Kirke B. Lawton, Signal Corps.



ROTC Camp, Summer of 1935.

We were sent to Camp Dix, New Jersey in the summer of 1935 for six weeks of practical training in Signal Corps operations. We lived in tents. Discipline was strict, we were "put on report" for being absent if we were just a few feet away from being in our assigned place in the formation when the "fall in" command was given. The punishment was being assigned guard duty during our leisure time when everyone

else was swimming, or to spend an hour "policing the area," picking up cigarette butts. I qualified as "marksman" with the Pistol, Caliber .45 M1911A1 on the pistol range.

We learned how to lay miles of telephone field wire and operate switchboards. One of the students was hit by lightning during a thunderstorm one afternoon when we were laying wire. He was lucky he wasn't killed. A student from Cornell ended up in the hospital when he accidentally stabbed himself in the leg with one of his pole-climbing leg irons. The training was great fun even if the heat, the dust, the rain and the mud combined to give us a realistic taste of what providing Signal Corps communications under field conditions was all about. I was promoted to Cadet Major in MIT's Signal Corps Unit in my second year of advanced ROTC.

I'm in the front row, second from the right, with my Signal Corps unit at Fort Monmouth, NJ.

My 1938 MIT yearbook, *TECHNIQUE* has a photograph of the 28 student members of the ARMY Ordnance Association.

Our honorary Signal Corps fraternity Pi Tau Pi Sigma apparently didn't have enough money in our treasury to pay for a photograph of us to be included in the yearbook. Our Theta Chapter of Pi Tau Pi Sigma was organized in 1933 at Fort Monmouth, New Jersey according to a news article in MIT's *The Tech*, Volume LIII, No. 42, Tuesday, November 7, 1933.

Co-Op Course VI-A

I applied to get into Course VI-A, the cooperative electrical engineering course. In the spring of our sophomore year we could apply to be in a special program for the next three years during which time we would be on a three semester per year basis. We would alternate a semester of study in Cambridge with a semester of work as a student engineer at a company. We would then be scheduled to receive both our bachelor's degree and our master's degree at the end of five years. I had applied to and had been accepted by both the American Telephone and Telegraph Company and the General Electric Company. My four AT&T work semesters were supposed to take place at Western Electric, Kearney, New Jersey; Bell Telephone Laboratories, New York City; New York Telephone Company, New York City; and AT&T Long Lines Department, New York City.

However, both AT&T and GE were having financial problems because of the depression. The national unemployment rate had been higher than 25%. The unions were upset at the thought of student engineers working and receiving 50 cents per hour when they were about to be laid off. Both companies had to temporarily suspend some of our work semesters. In fact, I only had two work semesters instead of the original schedule of four. Furthermore, one was with General Electric at Schenectady, New York and the other with AT&T at Western Electric in Kearny, New Jersey.

We VI-Aer's considered ourselves the elite of the elite. We had a club called Hexalpha, and we published both the *VI-A News*, a monthly newsletter and *Sparks*, an annual yearbook of about 40 pages with photographs of all of our professors

and naturally all of our graduating class. I was editor of the newsletter in the spring semester of 1939 and editor of the 1938 Sparks yearbook.

Perhaps to an outsider it was curious how we course VI-A cooperative students bonded. We probably felt superior to the ordinary electrical engineering students because we had been selected as the top 25% or so of the class. We sometimes felt like orphans because we rattled around, one semester in Cambridge, then the next semester at Schenectady, NY at GE or at Western Electric in Kearny, New Jersey for me.

When I lived in the dorms at MIT, I would send a suitcase full of my dirty laundry home to Hampton, Virginia by Greyhound Bus every two weeks. My mother would send the suitcase back with clean clothes plus peanut butter cookies or some other goodies. I bought my clothes at Filene's Basement. We were required to wear coat and tie to class, so Filene's was the most affordable source for suits and other appropriate attire.

I had several part time jobs while a student at MIT. Since the United States was still recovering from the depression, there was a federal program which provided funds to colleges for professors to employ student assistants to help by drafting illustrations for technical textbooks that the professor was writing or to do calculations for his mathematical research, etc. I had one of these jobs working for Professor Barrow, an electrical engineering professor for several of my undergraduate years. It was exciting and a learning experience for me since one engineer, Professor W.L. Barrow, was in effect competing with a large group of engineers at the Bell Telephone Labs to see who would be able to apply first for patents on microwave wave guides. Professor Barrow published a classic paper in 1936 and ended up famous in the Microwave Hall of Fame.

I also worked at Walker Memorial, the Student Union playing phonograph records at supper time for two hours. I received a free supper instead of money. I played records for the weekly dances and was able to invite a girl from Radcliff

to be my guest. We would eat our dinners in my control room. I worked for a florist in Boston who paid me to sell corsages to guys in the dorm since it was expected that you would buy some flowers for your date. I even made Hawaiian leis of dozens of carnations for the few big spenders. I would occasionally get invited during winter months by girls at Radcliff to come up to Harvard Square and walk to Radcliff's tennis courts which had been made into ice-skating rinks by spraying water to get ice two or three inches thick. In addition to the dormitories at Radcliff, there was a "Cooperative" house where a dozen girls lived because it was cheaper. They had a roster system to take turns buying food and cooking, cleaning their rooms themselves, etc. The dorms had dinning rooms and professional cleaning ladies.

I was secretary of the MIT Amateur Radio Club for several years. I wrote a monthly Club newsletter. I even raised money to cover the publishing expenses by having advertisements. I took the streetcar to Boston and persuaded Theodore and Milton Deutschmann, the owners of the "Radio Shack", a store they started in 1921 that sold amateur radio receivers and component parts, to pay for an ad. Fifty years later Radio Shack had grown to a 2 Billion dollars per year operation with 6,000 stores all over the country. W1MX was started in April 1909. The Harvard Wireless Club was started in 1909 but I have not been able to find the month – they claim to be the first college amateur radio station. In 1936 there was a lot of flooding in Pennsylvania. I still have a copy of the *Boston Globe* newspaper which had a photograph of Frank Gardner and me sending messages and communicating with disaster officials by amateur radio. One year the MIT Glider Club went to Springfield, Massachusetts to teach new student pilots how to fly. We installed an amateur radio receiver in the glider so that the instructor on the ground could give instructions to the student pilot, "Put your nose down – you look like you are going to stall!"

I lived in the dorms all my semesters in Cambridge. There were lots of interesting folks there. Raymond Popkin from

Brocton, Massachusetts lived just down the hall. He was a very inventive amateur radio operator. He was actually too inventive and too bright. He just would not do his homework and was expelled for a semester for poor grades. He reapplied and MIT gave him a second chance. He switched to General Engineering since he had such a bad image for many of the electrical engineering instructors. He had a typical (for him) type of research project for his bachelor's thesis. For people who liked to listen to music on the radio, he designed a special filtering device that would turn the radio set's volume to "off" whenever music stopped and a commercial advertisement came on. Then when the music started, it would go from "off" to "on." However, he didn't make a fortune from this invention because someone invented singing commercials about that time. Ray did make millions of dollars years later. He designed special color measuring instrumentation when color television was being developed. TV stations needed his instruments to adjust their color transmitting equipment. Manufacturers of color TV receivers need his instruments for their production lines to adjust and check the receivers.

Jack Rosenberg lived further down the hall. His father owned a grocery store in New Jersey and would send him a big box of goodies every week. We would all drop by Jack's room to help him eat the fruit and other stuff.

Graduate School

I was working on my Master's thesis research in September 1938 and taking one graduate course in acoustics at Harvard. MIT and Harvard had an arrangement that graduate students could take courses at the other school without paying tuition or any other bureaucratic obstacles. I was lucky to take a Harvard course at the Cruft Laboratory given by Professor George Washington Pierce, a famous physicist who had invented magnetostriction while doing sonar research for the U.S. Navy in World War I.

Building vacuum tubes in the student workshop at MIT, 1936.

I lived in the Graduate House at MIT for my fifth and final year. MIT had bought a three-story apartment house just across Massachusetts Avenue from MIT's main entrance. Three of us were assigned to a three-bedroom apartment. My room mates were Vernon Lippett and Fritz Darmsteder, a civil engineering student from Berlin. It was a large apartment with a good living room, kitchen (which we did not use) and a bathroom. We ate our meals in the Graduate House's large dinning room with the other graduate students. I met Elihu Root, III there, whom I'll write about later. A funny thing happened on the first day of school. There was a formal opening of the new Graduate House with a big dinner. Then people discovered that the placemats (perhaps thousands for a year's supply) had misspelled "Massachusetts."

My room mate Vernon was very bright. He had made perfect grades the first four years which was phenomenal.

He was Captain of the MIT basketball team and President of the MIT Drama Club. He was awarded a Rhodes scholarship to go to Oxford. This was unusual since he was an engineer and competing for a scholarship against all the students from Harvard, Yale, Dartmouth, etc. in the New England region. However, when World War II broke out in September 1939, all Rhodes scholarship were put on hold until the end of the war. Vern was invited to teach mathematics at Northwestern University all through the war until he was able to go to Oxford in 1946.

In October, 1938 I was offered a position as a Research Assistant in MIT's Electrical Engineering Research Laboratory. I would be allowed to take one course, my acoustics course at Harvard, and I could finish writing up my thesis on nights and weekends. Each of us graduate students was assigned a small office/lab space. I also had a key to give me 24-hour-a-day access to the EE building and also to the main library.

My thesis, "The Parabolic Sound Concentrator," was an investigation into mapping sound fields inside a five foot diameter copper bowl. I had to put the bowl in a parking lot and then send a beam of sound down from a third floor laboratory window. I had to do this research at night between four A.M. and six A.M. when there was no automobile or truck traffic which might have generated noise which would distort my measurements. I found that some theoretical research on estimating gain from a parabola had been published in Paris (in French). There were also two papers in Russian describing experimental research in Moscow and Leningrad. I asked Professor Timoshenko, in the EE Department to read and translate these papers into English for me. Then I was able to combine my experimental data with the two sets of Russian data and the French theoretical estimates to end up with a good master's thesis for Professor Fay.

I was happy that I finally had a proper engineering job with a monthly paycheck. As a research assistant with a bachelor's degree I received $100 per month. After two months, I bought a Ford Station Wagon – my first car – from a used-car dealer in

Cambridge for $125. It was five-years-old and had been traded in when a Morgan Horse farm in Vermont had bought a new station wagon. I decided to drive up to Vermont to places like Stowe ("There's always snow in Stowe , you know!") each weekend taking several passengers who would pay for the gas and give me enough money for my ski pass and room and meals expense.

I bought a pair of skiis from Professor Edgerton. He had put a small ad on the door to his stroboscopic lab advertising the skiis, with cable bindings, for sale. My German roommate, Fritz said that he would teach me how to ski instead of paying his share of the gas money. I found out later that I should not have accepted his generous offer. He did, however show me how to put on the skiis and how to get on and off the lift. Then, to my dismay, he said "Just keep your skiis parallel, close together, lean forward and follow me down the hill. I'll lap you and give your more advice when I pass you." So much for the lesson.

Skiing in Stowe, Vermont in 1938.

Professor Fay, my thesis advisor was a wealthy physicist (Harvard graduate) who taught acoustics at MIT. He was the acoustical consultant for the Boston Symphony. He asked me to be his assistant on a consulting job measuring the architectural acoustics of the Boston Symphony's "shed" at Tanglewood near Springfield. Massachusetts. He gave me one of his cars to drive to Springfield with our measuring equipment. I stayed in a bed-and-breakfast in the Pleasant Valley Wild Flower Sanctuary and went horseback riding every day after we had finished taking our measurements. I also installed and ran the public address system for the conductor, Serge Kousavitsky, to give a talk to dedicate the Shed and open the summer series.

Building Inventions with Dr. Vannevar Bush

The EE Research Lab project was to build a Rapid Microfilm Selector for Dr. Vannevar Bush, Vice President of Engineering of MIT. At that time sorting IBM punched cards could be done at the rate of 400 cards per minute. Dr. Bush had designed a Rapid Microfilm Selector which could sort microfilm records using transparent dots, the equivalent of holes in IBM punched cards, at the rate of 60,000 per minute. Microfilm in 1938 was just coming into widespread commercial use. Paper records of millions of items such as social security records, bank statements, and insurance records took up lots of space in filing cabinets. Furthermore, in case of fire these paper records might be burned so that some organizations felt it prudent to make copies of important records. Since this was before the Xerox era, making records could be expensive and time consuming. How could one copy a record which would be safer and require less storage? Filming an 8 ½ by 11-inch paper document by a 35mm camera had two advantages. One result was a smaller image on a roll of film — a different medium than paper and with the second advantage of a smaller volume of cabinets required to store the film. Every square foot of space for filing cabinets counted.

However, there were problems. Suppose you had several thousands or hundreds of thousands of records? With paper

and filing cabinets one could have them arranged in numerical order or alphabetical order. But suppose one had checks which arrived in random order and did not lend themselves to being filed in straight numerical order?

Dr. Bush had used the combination of microfilm (instead of paper cards) and Professor Harold Edgerton's new stroboscopic flash lamps, and some electronic circuitry built for measuring cosmic rays to design this machine. Dr. Bush had received grants of $10,000 from Eastman Kodak and from National Cash Register when he told them that he would have a working model within two years. The $20,000 grant paid for John Howard to do the mechanical design and be the supervisor, Larry Steinhardt for optical design and me for electronic design. I had been hired to replace Claude Shannon, the electronics designer who had decided to shift from studying electrical engineering to studying mathematics.

Claude had gone to the University of Michigan for undergraduate years and received two bachelor's degrees, one in electrical engineering and one in mathematics. He did the research for his master's thesis on Dr. Vannevar Bush's differential analyzer. His thesis, "A Symbolic Analysis of Relay and Switching Circuits," studied the use of Boolean alegebra and binary arithmetic. A paper based on this was published in the Transactions of the American Institute of Electrical Engineers. He became famous and a Harvard professor called Shannon's paper "possibly the most important and also the most famous master's thesis of the century." Claude worked at the Bell Telephone Laboratories during World War II and published a paper "A Mathematical Theory of Communications." Then people started calling him the father of information theory. He ended up teaching at MIT for years.

One of the features of the proposed Rapid Microfilm Selector was its use of the stroboscopic flash lamp which had been invented in 1936 by Professor Harold Edgerton. He had been doing his doctoral research on problems of vibration of rotating machinery. He wanted to take pictures of motors

rotating at 2,000 revolutions a minute so he needed to take a photograph with a light exposure of a few thousandths of a second. Modern cameras now use the stroboscopic techniques of Professor Edgerton's flash electronics.

Now for the reason I went to MIT. Once upon a time there was a graduation day speaker at Yale. The speaker spoke for about 20 minutes on the significance of "Y" in the University's name. Y stood for youth and the enthusiasm of youth, etc. Then he spoke for more than 20 minutes about the significance of "A" which stood for ability – the ability of Yale graduates to accomplish anything they decided to do, etc. After about 20 minutes discussing "L" which stood for the leadership role played by past Yale graduates, he appeared to be getting warmed up to his topic. One person in the audience then turned to the person next to him and said, "Thank God we are here at Yale and not at the Massachusetts Institute of Technology."

I had a happy five years at M.I.T. I lived in the dorms all the semesters I was in Cambridge. When I was on a work assignment semester such as the one at General Electric in Schenectady, New York I lived in the YMCA. It cost $7 a week to stay there and about a dollar each evening for dinner. It only cost 50 cents for lunch at the GE cafeteria. I would go swimming each day after I finished work. They had a bulletin board where you were supposed to record how many laps you swam so that each month they gave an award to the winner with the most laps. To keep us out of mischief, we had to go to an electrical engineering class two nights a week taught by the GE engineer who was in charge of recruiting college graduates to come to work at GE when they graduated.

I was originally assigned to work in the test section of Building 51 Turbines. The first project I was on was being an oiler for the test of a steam turbine for a generator for the city of Des Moines, Iowa. I had to record the temperature of the oil in the bearings every 15 minutes to watch for any danger signs of overheating. One of the other student engineers was in charge of opening a steam valve a half turn every hour for

eight hours to bring the turbine up to its full operational speed. I didn't like this assignment to electrical power equipment. I was a communications major and I wanted an assignment in a different part of GE. Our MIT advisor arranged for me to be transferred the following week to the test section in Building 89 Radio Transmitters where I worked the rest of the semester.

Building 89 had a contract from the U.S. Navy to build 100 radio transmitters for destroyers. My assignment was in the quality control unit to test the copper coils which were being prepared for installation in the transmitters. At last I was doing something meaningful in radio communications. Not only did I like my new job of quality control of inductances being produced for the new transmitters, but I was surrounded by men working on assembling the transmitters.

Special Assignment while working at G.E.

One day early in May, my supervisor told me that our boss, the head of Radio Transmitter Test wanted to see me in his office. When I reported in, he was looking at my personnel folder and said, "It says here that you have a Radiotelephone First Class License.

"Yes," I replied. I explained that my father was a Master Sergeant in the U.S. Army Coast Artillery teaching trigonometry to soldiers who were students at the Coast Artillery School at Fort Monroe, Virginia. When I was home for Christmas vacation from MIT in December, 1935 I found that one of father's friends was teaching his class of radiomen how to pass the Federal Communications Commission's exam for "Radiotelephone First Class" license. It was very thoughtful of the Army to teach these soldiers a civilian skill they could use to get a job in a radio broadcasting station after their enlistment was completed. I sat in on the four day class, went to the FCC office in Norfolk, Va. with them and took the exam. The exam was very thorough and it took me 40 pages of writing to answer all the questions. Fortunately, I had received such good instruction that I passed and still

have the official license certificate, dated December 30, 1935. I was 18 years old.

The boss then went on to explain that the President of General Electric had given a complete radio broadcasting station to St. Lawrence University in Canton, New York back in about 1922 when GE was increasing the power of its station WGY in Schenectady and replacing their transmitter with all new equipment. The University had one operator who had to go to Boston for a week in late May and had therefore asked GE if they could send a relief operator to Canton to keep their station, WCAD, operating. My boss explained that he could not get away at that time and asked me if I would go.

I was thrilled. My boss further explained that GE would buy my train tickets, and the University would arrange for me to stay in a dorm room and eat my meals in the Student Union at no expense to me. As a cooperative student engineer I would continue to receive 50 cents per hour ($20 per week) from GE. I found out later that General Electric billed the University $100 per day for me to run their broadcasting station during daylight hours from May 22 to May 27, 1937.

I had an interesting time running the broadcasting station. It was graduation week. I would arrange to broadcast the graduation ceremonies and play records for meal times in the student cafeteria.

I only had one work semester at General Electric because of the Depression, but since I had been accepted into the American Telephone and Telegraph Company program, I was able to get one semester working at Western Electric in Kearney, New Jersey. There were three of us at Western Electric that summer, Fred Lamb and John Doremus. We rented a two-bedroom apartment in Jersey City, a convenient bus ride from the factory. One day we heard that a company was going bankrupt and was selling big jukeboxes for $100. We put all of our money together, bought ten of them and shipped them to Cambridge to sell to MIT fraternities for $200 each. However, we only had a few dollars to last us for about a week before we received our pay of 75 cents per hour for the

week. We took a bus to New York City, stayed in Fred Lamb's aunt's apartment on 72nd Street, and bought some corn and hot dogs to eat. On the Sunday, we walked a zillion blocks to get to the subway station where we could get a cheap ride to Coney Island. We changed into swimming suits in a men's room and enjoyed a day at the beach.

Anyhow, the big graduation day came in June, 1939. I received both a Bachelor's degree and a Master's degree in Electrical Engineering, and a commission as a 2nd Lieutenant in the Reserves of the U.S. Army Signal Corps.

Parabolic Sound Concentrators

By R. C. Coile, *Journal Of The Society of Motion Picture Engineers,* Volume 51, September, 1948, Washington, D. C.

Summary

Parabolic sound concentrators have long been investigated for application to military antiaircraft location, radio broadcasting, and motion picture recording. Olson and Wolff, of the Radio Corporation of America, developed a combination horn-reflector concentrator in 1929. Obata and Yosida, of Tokyo University, published measurements of amplification in 1930. Hanson, of the National Broadcasting Company, described the use of parabolic reflectors in broadcasting in 1931. Dreher reported in 1931 on the use of microphone concentrators in motion picture production. Sato and Sasao published the results of tests on the sound fields of deep parabolic reflectors in 1932.

Rocard published an analysis of the theory of the amplification of the reflector-type parabola in 1932. Schneider of the Moscow Radio Center made amplification and directivity measurements in 1935 while studying the application of parabolic concentrators to Russian broadcasting and checked his amplification data with Rocard's theory. Gutin, in Leningrad, independently derived the theory of amplification and went on to analyze directivity in 1935.

This paper presents the pertinent historical background and reports on an experimental verification of the theoretical acoustical directivity of parabolic concentrators as well as further checks of the amplification theory. The sound fields inside parabolic reflectors have also been investigated experimentally with an agreement found with theoretical fields calculated by principles of geometrical optics.

Historical Background

The idea of using a parabolic mirror as a concentrator of sound by placing one's ear or a microphone at the focus was a subject of research in World War I. Waetzmann[1] has described German parabolas and Tucker[2] has reported on English and French development of plaster and concrete parabolic reflectors. The only quantitative data given in these reports is an

estimate by Waetzmann that for a parabola having an opening diameter of 3.2 meters and a depth of 0.8 meter the magnification was about five times compared with unaided ears for whispers and less for lower notes.

The first quantitative work published on sound concentrators was a report by Olson and Wolff[3] in 1929 of their development of a combination horn and reflector. The theory behind this was that the amplification of a reflector-type sound concentrator depends on wavelength of the impinging sound being less than the dimensions of the reflector. Hence the low frequencies whose wavelengths are larger than the dimensions are amplified very little. But by building a horn on the parabolic reflector, the amplification of the horn raised the low-frequency response. This design worked fairly well and microphone concentrators of this type have been used in Hollywood for recording motion pictures.

Obata and Yosida,[4] engineers of the Tokyo Imperial University's Aeronautical Research Institute, made a study of acoustical properties of some sound collectors for the aircraft sound locator in 1930. They made measurements of the amplification and directivity of two different horns and two 200-centimeter diameter open-bowl parabolic reflectors of different focal distance.

Dreher[5] reported on the use of microphone concentrators in motion picture production in this journal in 1931. Military searchlights with a microphone at the focus were used in outdoor recording, and other types of parabolic bowls were also used.

The developments of the National Broadcasting Company were announced in 1931by Hanson,[6] chief engineer. Measurements of the amplification, directivity, and effect of microphone position on the axis were reported on a design of an open-bowl parabolic reflector built by NBC engineers.

Engineers of the Aeronautical Research Institute, Sato, Sasao, Kubo, and Nisiyama published several papers[7,8] on the sound fields of parabolas in 1932. Their measurements were performed on deep parabolic reflectors and hence the results are rather complicated looking. The measurements were taken in the region beyond the focus, for the most part. These writers did not explain these results but merely said, 'The experiment was very laborious and troublesome and therefore was carried out with only two pitches of sound; C_2 and C_4... For C_4, the sound field becomes very complex

and many maxima and minima due to interference fill up the space in front of the mirror.'

In 1932, the first theoretical treatment was published in Rocard's paper[9] on 'Les Paraboloides Acoustique' in the *Revue d'Acoustique,* where Rocard derived an expression for the amplification of a parabolic reflector.

In 1935, Rocard's theoretical predictions were experimentally verified by Schneider,[10] an engineer of the Moscow Radio Center. Schneider's paper in the *Zhurnal Teknicheskoi Fiziki* examined all previously published work and reported on measurements of amplification which checked Rocard's predictions.

Neither Rocard nor Schneider had been able to cope with the theory of the directivity of a parabolic reflector. In 1935, Gutin,[11] a physicist in Leningrad, knowing nothing of the work of either Rocard or Schneider, derived independently the expression for amplification and went on to work out the theory of directivity which he published in the *Izvestia Elektropromishlennosti Slabova Toka.*

Experimental Study Of Parabolic Concentrators

An experimental study has been made of the following characteristics of the parabolic reflector: (1) frequency response, (2) amplification, (3) directivity, and (4) sound fields. The published experimental work on reflector-type concentrators has been very meager as outlined above. Most of the published papers show the results of experiments completed prior to 1932. The microphones used were not always of the highest quality or of small size–a desirable feature of a sound-field measuring device. Some of the work by Obata and Yosida,[4] for example, was done using a large homemade condenser microphone with most of the experimental work performed indoors with the sound source rather close to the parabola. What work had been done outside is open to considerable question because of ground effects, as the parabola was simply placed upright about a foot off the ground.

Other experimenters have used parabolas with opening diameters ranging from 40 to 300 centimeters. A 130-centimeter copper parabolic reflector was used in this experimental setup to simplify measurement of the sound fields inside the reflector for we might expect acoustical reflection similar to optical reflection when the sound wavelengths are small compared to the dimensions of the parabola and diffraction effects when the wavelengths are comparable to the dimensions. The large size of the

parabola indicated outdoor measurements to avoid errors from reflected sound although outdoor measurements present difficulties of wind and extraneous noises.

Kellogg[12] described five methods for minimizing echo errors in a paper in the *Journal of the Acoustical Society* some years ago. Fig. 1 depicts these schemes. In *A* both the loudspeaker and the microphone are well above the ground. If the distance is large compared with the wavelength of the lowest frequency employed the image sources are negligible. In *B* image sources are taken into consideration by placing both the loudspeaker and the microphone on the ground so that the difference between path length *r* from loudspeaker to microphone and the path length *r'* from image to microphone is less than a quarter wavelength of the sound. In *C* the speaker is supported in the air with the microphone on the ground. The sound reflected from the ground, if the ground is not a good absorbent, is sometimes strong enough to cause some back pressure on the loudspeaker. This can be fixed by putting the microphone on a slope as shown in *D,* so that the sound is reflected off at such an angle that it has little effect on the loudspeaker. One more method is to get the microphone out on a boom as far from any building as possible and to have the sound source at the corner of the building as illustrated in *E.*

The most convenient method for this particular experimental setup was a variation of *D* as illustrated in Fig. 2. The sound source was a General Radio beat-frequency oscillator which excited a Western Electric loudspeaker unit in a 6-foot exponential horn suspended out of a window of one of the sound laboratories at the Massachusetts Institute of Technology. The parabolic reflector was placed about 100 feet from the side of the building and was pointed toward the sound source. A Western Electric Type 630-A moving-coil microphone, step-up transformer, General Radio amplifiers, and General Radio output meter were used in the frequency response-amplification measurements, and a General Radio sound-level meter with a Brush sound-cell crystal microphone for sound-field measurements.

Frequency Response-Amplification

An expression for the theoretical frequency response and amplification of parabolic reflectors was derived independently by Rocard and Gutin.

For the parabola under test, *R* the radius of the opening was 65 centimeters; *a* the focal distance was 30 centimeters; and *l* the depth was

35 centimeters. The theoretical amplification at the focus is an inverse function of the wavelength and is plotted as the straight line in Fig. 3.

The frequency response and amplification of the parabolic concentrator were determined first by measuring the response of the microphone alone in free space, and then measuring the response of the microphone in the concentrator. The microphone was placed at the focus of the paraboloid. The measured frequency response and amplification characteristic are shown in Fig. 3. This agreement between measured gain of the concentrator and the computed values of amplification is as good as that reported by Gutin,[11] for the work of Obata and Yosida,[4] and the comparisons reported by Schneider.[10] The measured amplification differs from the computed amplification by about 10 decibels at the higher frequencies (7000 cycles) for the parabola investigated. Obata and Yosida's[4] measurements for frequencies from 475 to 188 cycles show the same trend, a divergence between theory and measurement for the higher frequencies. At their highest frequency of 475 cycles, the difference between theoretical and measured amplification was on the order of 20 per cent for one parabola 200 centimeters in diameter and 72.5 centimeters in focal length; and about 80 per cent difference for another parabola of the same diameter with a 54.5 centimeter focal length. The curves of Schneider show this same trend. Schneider does not draw theoretical curves for frequencies higher than 4000 cycles because the disagreement is so large.

The size of the probe microphone used in the measurements affects the accuracy of the results. Schneider used three microphones in his tests, a large Reisz (carbon) with a diaphragm area of 70 square centimeters, a small Reisz with a diaphragm area of 40 square centimeters, and a condenser microphone with an area of 20 square centimeters. Examination of his data shows that the smaller the diaphragm area, the better the agreement between theoretical and measured results. Schneider did not attempt to explain this phenomenon. It may possibly be attributed to phase-cancellation effects, the diaphragm being so large that the higher-frequency sounds which behave more or less as geometrical optics predict, arriving in pencils of rays, hit the diaphragm in different phase thus reducing the output. Instead of having an infinitely small collector of the sound arriving at the focus in phase, we have a large sound-receiving surface that can pick up sound of different phase which will tend to reduce the output. The Western Electric Type 630-A microphone used in the

frequency response-amplification tests has a diaphragm area estimated at 10 square centimeters, and the Brush sound-cell crystal used as a probe microphone in tracing out the sound fields has an area estimated at 2.5 square centimeters.

Directivity

The directivity characteristic is important in many applications of the parabolic reflector. Sato and Sasao have published experimental directivity curves and Schneider published some curves. The first published paper on an analysis of the theory of the directivity of the parabolic reflector is that of Gutin, who derived an expression for the coefficient of amplification at the focus of a paraboloid for an arriving sound wave whose normal made an angle *a* with the axis. Gutin derived a simpler expression using the theorem of reciprocity that is essentially the same at higher frequencies. Gutin has given a table showing the position of the first minimum of the directivity for values of *R/2a.*

The measured directivity characteristic is shown in Fig. 4. The directivity was determined first by lining up the axis of the parabola with the axis of the 6-foot exponential-horn sound source, and then tilting the parabola and measuring the response at different angles. The lobes other than the fundamental were negligible and could not be distinguished from background noise. The main features of interest are the angles at which the response falls to its first minimum. These angles can be calculated by the method developed by Gutin. The procedure is as follows: The angle at which the directional characteristic goes through its first minimum is given by the expression alpha = $\sin^{-1}$K lambda/R where lambda = wavelength of sound being received; *R* = radius of opening of parabola; and *K* = constant depending on *R/2a* (see Table I).

The constant *K* is determined by calculation of *R/2a* and then use of Table I. For the parabola investigated *R* = 65 centimeters; *a* = 30 centimeters; *R/2a* = 1.08; *K* = 0.69. Hence we can compute the angle of the first minimum.

This agreement of theoretical and measured angles for the first minimum was a reasonably good check of Gutin's directivity theory. It is of interest to note that the *Izvestia Elektropromishlennosti Slabovo Toka* is available at so few libraries in the world that even Schneider, another Russian, publishing his paper in the *Zhurnal Teknicheskoi Fiziki,* also in 1935, stated 'The story of the concentrator is very complicated. The

amplification has an approximate solution... The directivity characteristics are without theory...'

The experimental directivity curves of Schneider measured with a condenser microphone have also been compared with theoretical predictions. The calculations have been carried through in a manner similar to those for the parabola at the Massachusetts Institute of Technology: R = 47 centimeters; a = 27.4 centimeters; $R/2a = 0.86$; K = 0.675.

The results check reasonably well with the exception of the 1600-cycle data. However, Schneider's measurements were made indoors so that there is a greater possibility for a freak measurement than if the measurements had been made outside with less chance of reflections introducing errors.

Sound Fields

There has been very little published on the sound fields of parabolic reflectors. Sato and Sasao[8] have reported measurements on fields in a deep parabola. These previous experiments studied complex sound fields in regions beyond the focus. It was thought of interest to examine the region between the focus and the vertex.

According to the principles of geometrical optics a source placed at the focus emitting spherical waves will have them reflected at the walls of the parabola and sent out as plane wave fronts. And, conversely, plane waves arriving at the parabola will be reflected as spherical waves converging on the focus. When the incident and reflected waves meet there can be either constructive or destructive interference. If the difference in path length is m lambda, where m = 0, 1,2, 3, 4, ... there will be constructive interference. If the difference in path length is $(2m+1)(\lambda/2)$ where m = 0, 1, 2, 3, 4,... there will be destructive interference.

Hence, in attacking this portion of the problem, the contours of constructive and destructive interference were first determined by geometrical optical construction and then measured by the acoustical setup described.

The construction of the reflected wave fronts is a simple matter. The fundamental definition of a parabola is that it is the locus of points equidistant from a fixed line called the directrix and a point called the focus. Reflected wave fronts may be constructed in a graphical manner similar to that outlined by Wood.[13]

In Fig. 5 let O be the focus of the parabola and line BD the directrix. Let the unreflected wave front be represented by line HG.

Through any two points on the parabola *A* and *C* draw lines from *O*, the focus. Construct circles about points *A* and *C* of radius equal to the distance from these points on the parabola to the unreflected wave front. A circle drawn about *O* with radius *OE* will pass through point *F* and will be the reflected wave front. This may be proved as follows: every point on the parabola is equidistant from focus and directrix, *OA = AB* and *OC = CD;* the small circles constructed about *A* and *C* had radii of *AE = AH* and *CG = CF;* but now *OE =BE* and *OF=DG* adding the two parts of each line. But since *DG=BH,* for the unreflected wave front is parallel to the directrix, hence *OE =OF* and a circle of the reflected wave front has been determined. Now we can see that as the unreflected wave front moves into the parabola, the reflected wave fronts become smaller and smaller circles converging on the focus.

A useful short cut in drawing these wave fronts is apparent on examination. The reflected wave fronts, circles about the focus, intersect the parabola at the same points as the unreflected plane wave front. Therefore, it is an easy matter to draw a circle with center at the focus and radius equal to the distance from the focus to the points of intersection of the parabola and the plane wave front.

Using this simple method of constructing reflected wave fronts, the contours of points of constructive interference (maxima) and points of destructive interference (minima) may be traced out after finding these points by checking path lengths. This construction is illustrated in Fig. 6. A series of plane unreflected wave fronts approaching the parabola has been drawn spaced a half wavelength apart. The frequency of 1720 cycles per second has been chosen to give a convenient wavelength of 20 centimeters (lambda = *c/f* = 34400/1720). A series of concentric circles converging on the focus has been drawn corresponding to the *c/f* approaching plane wave fronts. There are numerous points of intersection. For each of these points we trace out the difference in path length between the incident and reflected wave. For example, at the surface of the parabola the path-length difference is zero, hence constructive interference; but moving out from the parabola along any circle of a reflected wave front there are points whose path-length difference is lambda/2 designated by a minus sign; lambda designated as plus, 3 lambda/2 minus, etc. The points of constructive interference marked ‘plus’ have been joined and in a similar fashion lines

have been drawn through the 'minus' points. These lines are the contours of maxima and minima.

These contours were traced out by a crystal probe microphone and a General Radio sound-level meter. Predicted and measured data have been plotted in Fig. 7. Examination of the figure shows the theoretical contours of constructive interference plotted as solid lines in the upper half of the parabola and the theoretical contours of destructive interference plotted as dotted lines in the lower half. Of course, both contours occur in three dimensions as a series of confocal shells of paraboloids of revolution, but for our purposes the contours are cross-section pictures of the parabola with the contours of minima made invisible in the upper half and the contours of maxima made invisible in the lower half.

The experimental points have been plotted as little circles for maxima and *X*'s for minima. There are two places where the points do not check so well, points a great distance from the axis, and points on the axis. The explanation for the discrepancy of the points quite distant from the axis may be attributed to two things: distortion of the sound field by ground effects, and/or lack of rigidity of the microphone probe equipment. Measurements could not be made with sufficient precision to determine quantitatively the magnitude of the ground effect. For the purpose of checking the theoretical contours of constructive and destructive interference the experimental points nearer the axis must suffice and it is felt that, on the whole, a reasonable agreement is found within the magnitude of the errors of measurement.

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Chapter 4
Magnetician, Carnegie Institution of Washington, D.C. – 1939 to 1942

Elihu Root III and I met in September 1938 when we were graduate students working on Master's degrees. We both lived in the Graduate House at MIT. By chance, we both went to Washington DC in June 1939. Actually, we both went to the Carnegie Institution of Washington but to different departments.

The Carnegie Institution of Washington had offered me a job when I graduated in June 1939. My position was with the Department of Terrestrial Magnetism and Atmospheric Electricity.

Andrew Carnegie had set up the Carnegie Institution of Washington about 1904 when he was busy in his race with John D. Rockefeller to see who could give away the most money. Andrew Carnegie had made his money in steel while John D. Rockefeller had made his money in oil. Both apparently had the "guilts" for making so much money and were trying to give money away to buy forgiveness or something. John D. Rockefeller "won" since he gave away about $280 million between 1890 and 1910 while Andrew Carnegie gave away about $220 million. Andrew Carnegie offered to build a library building for any town or city in the United States which would promise to buy some books and hire a librarian. The Pacific Grove Public Library was built in 1908 by Andrew Carnegie. The public library in Norfolk, Virginia was built in 1909 by Andrew Carnegie. Andrew Carnegie gave the money to establish the Carnegie Institute of Technology in Pittsburgh. Many years later the Mellon family gave them a lot of money and the name was changed to Carnegie/Mellon Institute of Technology.

The British Royal Navy had been doing scientific research for many years by taking scientists such as Darwin on voyages.

Royal Navy ships on voyages of exploration had artists on board to make sketches of natives. The ships had research projects to toss bottles overboard with a note "Return this note to the Royal Hydrographer, Greenwich, England with the latitude and longitude of the location where you found it and we will pay you two shillings." This research helped collect data on the direction of currents in the ocean.

The director of the U.S. Coast and Geodetic Survey asked Andrew Carnegie in 1904 to donate money to establish a research Laboratory in Washington. Carnegie gave $40 Million dollars to build a headquarters building on 16th Street, N.W, to build a Geophysical Laboratory and to build a Department of Terrestrial Magnetism and Atmospheric Electricity on Broad Branch Road in Northwest Washington. The Geophysical Laboratory concentrated on volcanoes, and the Terrestrial Magnetism Department did research on magnetism. After the Carnegie Institution of Washington was established, a non-magnetic sailing ship was designed and built of wood with bronze bolts. This ship named "Carnegie" made seven research trips around the world each taking about three years. It was destroyed by a fire in Samoa while refueling. The Carnegie measured the declination of a ship's compass — the difference between the compass pointing towards the north magnetic pole and the geographic North Pole. The magnetic north pole is approximately 1,000 miles from the geographic North Pole. The magnetic pole slowly changes its position. Every year the magnetic north pole is in a different place from the previous year. A ship's navigator must apply an appropriate correction to the map's declination in order to plot the desired course for the ship to go from San Francisco to Honolulu, for example.

Elihu Root III was hired as a personal research assistant by Dr. Vannevar Bush, former Vice President of MIT who had just become the President of the Carnegie Institution of Washington. Dr. Bush had invented an electro-mechanical self-justifying typewriter and Elihu was to build it.

Hired

I was hired by Dr. Jno. A. Fleming, Director of the Department of Terrestrial Magnetism and Atmospheric Electricity. "Jno." is the official abbreviation for the name "John" according to the Oxford English Dictionary, and Dr. Fleming insisted on this format in everything written that carried his name.

The Carnegie Institution of Washington had sent Ellis Johnson, a physicist who was an MIT graduate, up to MIT to interview possible job applicants. One of my professors, Prof. Ralph D. Bennett, had nominated three of us graduate students to be interviewed. Johnson interviewed the other two applicants, but I was actually in New York City presenting a paper at the annual meeting of the Acoustical Society of America. When I was working on my Master's degree, the electrical engineering department had a requirement for all of us to learn how to do library research, write reports, and give lectures. We needed to find out what other engineers had published on the subject of our research before we began our own laboratory or theoretical work. I had examined the "Development of Modern Microphones" for my library project and had written a 150 page report with more than 100 illustrations. John Doremus, one of my classmates, was an excellent photographer and he took photographs and printed out all the illustrations while I "helped" him in the darkroom. As it turned out I changed my research to examining the sound fields inside a parabolic reflector. My presentation was made before an audience of all the other EE graduate students and our EE professors who were encouraged to ask questions in the discussion period. The EE department secretaries served tea – the high point of the afternoon.

Since I was going to be in New York City, I asked if I could take the train to Washington and be interviewed at the Carnegie Institution's Department of Terrestrial Magnetism and Atmospheric Electricity on Broad Branch Road. This resulted in me being interviewed by three other physicists in addition to Ellis Johnson since I was there all day and they

took me out to lunch. I am just guessing but I think the reason I was hired was the following: The other two applicants were married, and I was not. I think that I was selected because the director of the Department of Terrestrial Magnetism was very frugal. The new hire was scheduled to go to the Carnegie Institution's Huancayo Magnetic Observatory in Peru for a three year assignment after six months of indoctrination in Washington. Perhaps Dr. Fleming felt that one steamship fare for 13 days on a Grace Line freighter from New York City to Callao, Peru was better for his budget than two tickets for a couple. Anyhow, I got the job.

With my parents at their home, 123 Pochin Place, Hampton, Virginia after graduation from MIT in the summer of 1939.

I drove down to Washington in June, 1939, the day after graduation. I stayed with my Aunt Hetty and Uncle Louis Cleven at 610 Ninth Street, NE for two days while I looked in the classified advertisement section of the Washington Post at

the ads for rooms for rent. I found a marvelous room for rent in Georgetown (where I was born) in the home of a lawyer who worked at the Patent Office. The couple had no children and rented me their spare bedroom on the second floor which had its own small screened-in porch. There was also a bed out there because sleeping outside was more comfortable in hot nights with 90-degree temperatures in August.

When I reported in to the Department of Terrestrial Magnetism and Atmospheric Electricity, I was apprenticed to Dr. Wallis, a magnetician — no, not magician — magnetician, someone who studies the magnetism of the earth. I believe I was the last person to be given this title by the Carnegie Institution of Washington. Anyhow, my mentor, Dr. Wallis was a famous explorer in the scientific community. Years before, he had crossed Ethiopia riding a mule, stopping each day to determine his latitude and longitude and the strength of the earth's magnetic field, etc. He tried to teach me how to be a magnetic explorer. Each day I would look at the sun through a transit on the back lawn of our laboratory building on Broad Branch Road, N.W. and determine my latitude by observations of the sun at high noon. Fortunately I had been an engineering student at the University of Maryland and MIT. Both colleges had the requirement that all freshman engineers take a course in surveying "because George Washington had been a surveyor."

Peru

I had only worked June, July, and August, 1939 in Washington when I was told that I would be sailing from New York to Peru in a week. The British had declared war on Germany on September 3, l939. The observer in charge at the Huancayo Magnetic Observatory in Peru had been a reserve officer in the Royal Canadian Navy and had been called to active duty. Therefore I was to leave on the next ship going to Callao, Peru — a Grace Line freighter which carried 20 passengers.

I went through the Panama Canal again. I had already been through the canal when I was six-years-old when my father,

a soldier, had been stationed for three years in the Panama Canal Zone at Fort DeLesseps on the Atlantic side. Our ship stopped in Columbia, Equador and northern Peru to unload cargo and people before we arrived at Callao, the port for Lima, the capital. We went through customs easily, as the Bill Culmsee, the Australian observer who had come down from Huancayo to meet me had carefully paid the customs brokers to bribe the appropriate customs officers. I was shocked but he explained that it was necessary to get the spare parts for the observatory's instruments through customs without being stolen or damaged.

I had an interesting job for two and a half years at the Huancayo Magnetic Observatory. The observatory was in the Andes at a height of 11,000 feet. It was at latitude 8 degrees South but on the geomagnetic equator since the magnetic North Pole is about 1000 miles from the geographic North Pole. It was about 10 miles from the town of Huancayo which was at the end of a railway line from Lima about 150 miles away. The railroad was built in 1896 to go to the copper mine at Cerro de Pasco. It went through a pass at 15,900 feet, which was the lowest pass in the Andes for several hundred miles. This pass at the backbone of the Andes was within 100 miles of the Pacific Ocean.

This was a geophysical observatory, not an astronomical observatory with telescopes. We carried out research on the earth's magnetism, electrical currents flowing in the earth's crust, earthquakes, atmospheric electricity and lightning. We had a special cosmic ray measuring apparatus designed by Professor Arthur Compton, University of Chicago, brother of Dr. Karl Compton, MIT president. We measured the height of various layers of the ionosphere to assist in research on short wave radio propagation. The one thing we did which was not geophysical was to participate in a world-wide program to observe the sun for sunspots. Our observatory was assigned a 30 minute period each day and one of us had to observe the sun through an instrument called a spectrohelioscope.

We had a seismograph given to the observatory by the California Institute of Technology in Pasadena. We sent any earthquake data by amateur radio to an operator in Philadelphia who would send our info to Washington, D.C. There were three of us observers at the observatory plus about ten Indians. We had two Indians who spoke some English who had been some years ago to a school in Huancayo run by missionaries. They worked in the office processing data. Then we had two teenage girl kitchen helpers, a truck driver/mechanic, a gardener and two night watchmen. Quechua was the native language of these Indians, but they spoke a little Spanish.

The wooden observatory buildings had been built in 1921 by two carpenters sent down from Washington. We were miles from the nearest village so that the delicate instruments would not be affected by anything magnetic. During the rainy season we collected rainwater from the roof of the main house. We had a hydraulic ram which automatically pumped water from the Mantaro River, a half mile away. We had a diesel engine running a generator which provided us with electricity for house lights and our instruments. For backup, we had two gasoline engines with generators in case anything happened to the big diesel. For backup to the backup we had a number of large glass telephone exchange-type batteries for providing electricity for the instruments. The refrigerator had been modified to run on kerosene and the kitchen stoves ran on kerosene.

A few months after I arrived at the Huancayo Magnetic Observatory in October 1939, I read in the alumni news section of MIT's Technology Review that there was a chemical engineer, Tom Terry, MIT Class of 1936 working at the smelter of the Cerro de Pasco Copper Company at Oroya, altitude 12,000 feet about 90 miles north of Huancayo. In fact the railroad line built by a British company about 1896 went from Lima to Oroya. Then a branch went north to terminate at the actual copper mine at Cerro de Pasco, altitude 13,000 feet and another branch came south to terminate at Huancayo,

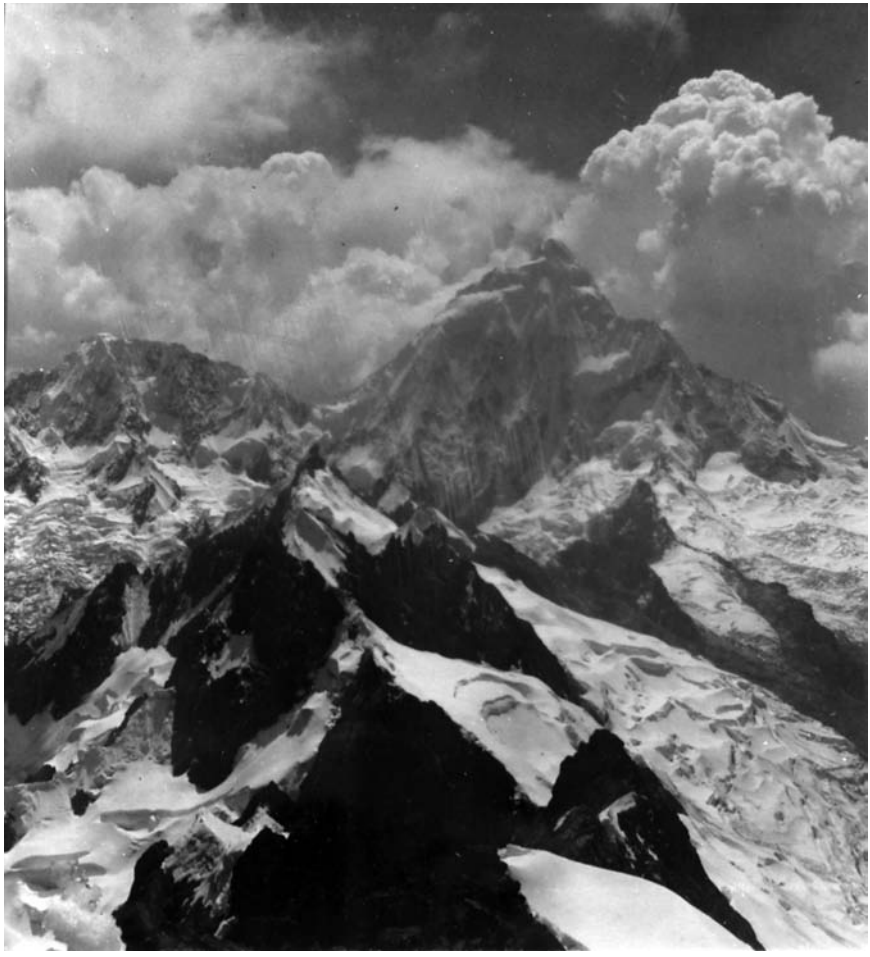
altitude 11,000 feet. I wrote to Tom to say hello and he invited me to come to Oroya and he would show me the smelter.

I drove to Oroya and went to the bachelor dorm. Tom was getting dressed to go to work on the midnight shift. First he put on long underwear, then three sets of jeans and sweatshirts, successively larger. He explained that the smelter fumes would make his clothes disintegrate after a few work sessions. I was surprised to see a dead Andean Condor hanging in his closet. Tom had bought it from one of his Quetchua Indian assistants. Tom planned to make a Halloween costume out of the feathers. The Indians trap the condors by building a round enclosure which they bait with a dead sheep. The condors land to eat the sheep but cannot takeoff because they have to run along the ground to get up to flying speed and the enclosure wall and twigs makes them crash.

When I visited him he introduced me to his friend, John Coyle. John later went to MIT in 1948-49 to study geology. John's father was David Cushman Coyle, a famous economist and popular author, who was a personal friend and economic adviser to President Roosevelt. John had gone to Princeton for two years but his father's lack of money during the depression had forced him to transfer to Antioch College in Yellow Springs, Ohio. Antioch had a cooperative-type of program where student could find themselves a job in alternate semesters and earn enough money to work their way through college. John was very clever and won an award for "Best Young Metallurgist of 1939" for a scientific paper he had published.

Anyhow, Tom, John, and I did a variety of things together for the two years I was in Peru. We went mountain climbing. The train from Lima went through a pass at 15,900 feet so we would start from there and climb the nearby peak to 17,300 feet roped together. At MIT I had belonged to the Outing Club and we had gone on a number of joint trips with folks from the Harvard Mountaineering Club to learn rock climbing. We also practiced on climbing on glaciers in winter climbs on Mount Washington with crampons, cutting steps with our ice

axes, etc. We were invited by two members of the Harvard Mountaineering Club in1941 to attempt to climb an 18,860 foot mountain called Huagoruncho.



Huagoruncho, the unclimbed 18,860 foot peak I attempted to climb as part of a Harvard Mountaineering Club expedition in 1941.

Our climbing attempt was published in the 1943 American Alpine Journal. We didn't make it, but it was finally climbed years later by one of the members of the original British team to climb Mount Everest. We went fold-boating. The Mantaro River, one of the headwaters of the Amazon had its origin

at a glacier about 100-miles north of Cerro de Pasco. The river was continuous white water for several hundred miles as it passed by Oroya and Huancayo. We went spelunking, which I didn't like that much as it involved crawling around underground not knowing where we were. We helped some amateur archeologists explore some ancient cliff dwellings.

I was Best Man for Elihu Root III. Here I am with his bride, Molly Bidewell at the church in Scarsdale, New York on their wedding day in 1943.

After I had been in Peru for some time I bought some silver for a friend, Molly Bidewell, who was a senior at Radcliff. I mailed it to Elihu Root so that he would pay the duty on it. I asked Hu to please deliver it by hand to Molly so that he would have a legitimate reason to meet her. I am glad to report that everything worked according to plan. They eventually got engaged, and invited me to be best man at their wedding. This took place in 1943 during the war when I was a Captain

in the Army's Signal Corps. I had an interesting moment before the wedding when Molly introduced me to an uncle of hers – Major General Ulysses S. Grant III. Molly said to me, "You military men will have so much in common."

Elihu Root III and I head for the church for his wedding.

Each of us observers took turns going down to Lima every six months for a week. This was designed to get us out of the 11,000 foot altitude. Just by chance, I was in Lima on May 24, 1940 when Peru had a damaging 8.4 Richter magnitude earthquake. About 200 people were killed as adobe houses disintegrated and the clay roof tiles fell on the people inside. I was actually on an electric streetcar going the five miles or so to Callao, the port on the ocean. The streetcar jumped off the tracks but did not fall over. The overhead wire broke and

was sparking on the street. Adobe houses on both sides of the street were disintegrating with big clouds of dust. I hurried toward Callao about a mile onward as I had been invited to have lunch there by Mr. Davies, the previous observer-in-charge of the Huancayo Magnetic Observatory. I didn't understand why everybody else was hurrying the opposite direction towards Lima. My friends lived in a concrete house and were OK. They gave me a history lesson which explained why people were fleeing away from Callao. Apparently, there was a large earthquake in 1746, magnitude 10 on the Richter scale. A large tsunami came ashore at Callao. One historical account reported that 4,000 people drowned, another said 18,000, and another reported 4,941. A church was built about half way between Callao and Lima at the high water mark of the tsunami as a memorial to those who were killed.

The Observatory had been operating since 1921 with three observers. There were two houses on the grounds. The observer-in-charge had a large house with the second floor divided into two suites of two bedrooms and a bath room. Downstairs there was a large living room, dining room, and kitchen. There was a small house for two bachelor observers which had two bedrooms, each with a bathroom and a small living room. All the observers ate three meals a day at the big house where the wife of the observer-in-charge had two teen-age Indian girls to help cook, wash dishes, do the laundry and ironing, etc.

The previous observer-in-charge, Mr. Davies, a reserve officer in the Royal Canadian Navy had resigned in September, 1939 when the British declared war on Germany and he was called to active duty. His assistant Mr. Wells was promoted to observer-in-charge. Mrs. Wells and their two year old son were there also. The third observer when I arrived was Bill Culmsee, an Australian geophysicist who had rotated to Huancayo after being an observer at the Carnegie Institution's magnetic observatory at Watheroo, Western Australia for two years.

When isolated at the Huancayo Observatory 150 miles inland, my transportation included: a horse, motorcycle, foldboat to use on the headwaters of the Amazon five miles away, and later I bought a car. I had be able to travel the dirt road 80 miles up to the copper smelter, as well as the dirt road from the observatory to the town of Huancayo. I first bought a motorcycle from my Australian roommate, an old English one cylinder Norton, very rugged. Any time something went wrong, I would send a cable to England and they would air mail the parts.

The seasonable weather was hard on the roads and affected our travel. We had the dry season for six months and then the rainy season with torrential rain daily for six months. Temperatures would drop to 20 degrees at night for three months of the dry season because of altitude and winds. The observatory put down gravel on the dirt access road so cars wouldn't slip off the road during the rainy season. I remember another hazard — the road to the coast closed several times due to mudslides. The blockage lasted three or four weeks until the government could rustle up enough people and shovels to clear the road again.

Bill and I lived in the small house for bachelors and ate our meals with the Wells. When I was in Washington, I had heard all sorts of stories about the difficulties and personality conflicts of people living at the observatory in such isolated conditions. I had initially found them hard to believe, but Bill and I ended up not on speaking term with Mrs. Wells within three or four months. I think it was the meals that got us off on the wrong foot. Apparently she was saving money for them to buy a house when they returned to Washington. We thought that it was not fair to us that she was taking the daily allowance for our meals which she received from the Carnegie Institution and not giving us proper meals. For example, she had the Indian cooks prepare porridge every morning for us. I like porridge, but she would buy oats in 10 kilo sacks in the market in Huancayo. The Indian selling the oats would put little pebbles in the bottom of the sack of oats to bring

the weight up to 10 kilos. This resulted in little unpleasant surprises when we ate our porridge. Bill and I would have preferred more breakfasts with bacon and scrambled eggs which Mrs. Wells could have easily bought with the food allowance for us that she was receiving. Fortunately for us, Mr. Wells and family were returned to Washington about five months after I arrived. A sociologist would have been interested in the fact that not one of the Indians working at the observatory came to say goodbye when the Wells family left.

This was in sharp contrast to a similar event a month earlier when Bill Culmsee left for England and all the Indians at the observatory gathered to say goodbye to him. There had been a big disaster at Dunkirk. The British Army was still sending troops to France because the French had not told the British that they had surrendered to the Germans. The British then had to muster all sorts of naval and merchant ships plus private yachts to evacuate British troops from Dunkirk before the advancing German forces arrived.

About that time the British set up an Empire Pilot Training System and appealed to young men in Australia, Canada, South Africa, and elsewhere in the British empire to come to England and join the Royal Air Force. Bill went to Lima to the British Consulate and applied for this Empire pilot training scheme. They arranged for his flight physical exam and then provided him with transportation to Canada. Bill went to a primary school for pilots in Canada, then to an advanced training school for multiengine bomber pilots. When he was qualified he was sent to England and assigned as a copilot to an operational bomber squadron.

I found out years later from his sister that his aircraft had been shot down by German air defense antiaircraft guns on his first bombing mission and Bill, who was the copilot, and the entire crew were killed.

Some years after the end of World War II, I stumbled across a laboratory notebook containing some data Bill Culmsee and I had collected on thunderstorms at the observatory. We were

in one of the most thunderstorm-active areas of the world. A British meteorologist had made some worldwide surveys and found data for some place in Indonesia which he had concluded had the most thunderstorms in the world. It was interesting that Huancayo was a close second. I prepared a scientific paper entitled, "Note on Thunderstorms at High Altitudes in the Tropics" by Russell C. Coile and William Culmsee. Our paper was published in the *Journal of Geophysical Research*, Vol.58, No.2, pp 280-281, June 1953. I telephoned the Australian Embassy on Massachusetts Avenue in Washington and spoke to the Scientific Attaché. I told him about our paper and asked him if he could find a mailing address for Bill Culmsee's parents or other relatives in Western Australia. Bill had graduated from the local University there and then had worked for the Carnegie Institution's magnetic observatory at Watheroo, Western Australia. The attaché wrote to me a few weeks later telling me that Bill's parents had died, and gave me the married name and address of Bill's sister. I mailed a copy of our published paper to Bill's sister. She immediately sent me a long letter thanking me for the paper and telling me that she remembered Bill's talking about his happy days in Huancayo. He had told her about driving down to Lima to meet my ship at Callao and helping me get the annual boxes of spare parts for the observatory's instruments through customs. It was sad that so many of my friends such as Bill were killed during World War II. I was glad that after Bill's death I was eventually able to get our paper published in an internationally famous journal and get him some recognition for his scientific contributions.

The new observer-in-charge Mr. Paul Ledig and his 14 year old son Paul, Jr. were welcome arrivals. The Indians called the son "Pablito" (little Paul). Mr. Ledig had signed up his son to study high school by correspondence courses. The Calvert School in Baltimore, Maryland had developed correspondence courses for home schooling for children of missionaries. This was a very good system. Mr. Ledig made Paul study two hours each morning and each afternoon and

then mail in his homework. Young Paul and I would go horse back riding every morning before breakfast and then usually between four and five in the afternoon after I had finished my observatory work. I had a horse, and I was keeping a horse named Brownie for my friend, Wilhelm Mayer.

On my horse, Rusty, at Huancayo, Peru in 1940. I'm in my role as "The Villain" in one of Pablito's "Movies."

I had ordered some mountain climbing boots by mail from the original Abercrombie and Fitch in New York City. In those days Abercrombie and Fitch was the leading expedition outfitter with one store in New York City, and not a chain of T-shirt shops in suburban malls. I was delighted to find when the boots arrived that they were just the right size. I had also ordered a "foldboat" from a company in New York City, an American copy of the original German Folbot. This boat was sort of like an Eskimo kayak, 15-feet long with a cockpit for two people with an apron covering the cockpit which you could tie under your arms to keep water out of the

boat if you had water washing over the bow in rapids. I had never done any white water canoeing, but the Observatory was only a half-mile from the Mantaro River which came from a glacier 100-miles upstream. The foldboat came in two large bags. One bag had the canvas hull and the other bag had numerous poles and plywood ribs to form the skeleton. It took us almost an hour to assemble the skeleton and cram it inside the rubberized hull.

When I first arrived in Huancayo, Bill Culmsee had introduced me to the three people in town who spoke English. The first person was a Peruvian about my age who had just returned from living in New York City for three years. It was a big surprise to me when he died from amoebic dysentery about three weeks later. Wilhelm Meyer from Hamburg, Germany was Jewish and his father had sent him out of Germany about 1938 after Hitler had begun his anti-Jewish activities. Wilhelm's father had a friend in the hardware business who had arranged for Wilhelm to be the agent for his German hardware company in the mountainous region of central Peru. Wilhelm traveled around persuading local merchants to order machetes, hammers, nails, saws, etc, from him. The third person was a woman a couple years older than I was whose father was Chinese and mother was Peruvian. Her father had sent her to China when she was about ten years old to go to school in a convent until she was eighteen. She spoke excellent English since one of the teacher nuns was English. When she came back to Peru, an American miner at the Cerro de Pasco copper mine persuaded her to marry him. She had a baby boy a year later, but then divorced her husband who had turned out to be an alcoholic.

One day Wilhelm invited me to go on a walking trip to visit some Germans he had met who lived in the jungle. Sometime in the early 1930s, the German government took advantage of a homestead scheme the Peruvian government had established to encourage families to come from Europe and live in Peruvian jungle areas. If a family came and lived on a homestead for five years they would be given the land

with a clear title. Wilhelm went there once a year to try to sell these Germans machetes, shovels and other hardware items. It was a two day walk from the end of the road. I thought that it was funny that although Wilhelm usually sold hardware made in Germany, there was a curious exception for machetes. The German homesteaders tried to persuade local Indians (headhunters/headshrinkers actually) to work on their coffee farms for them. They could not pay the Indians in money which was of no use in the jungle where there were no stores. Therefore the Germans paid them in things like machetes or axes or knives or something the Indians really wanted. Somehow the Indians had developed a preference for machetes made by an American firm in Connecticut called "Collins." The Indians would angrily reject any machete offered to them unless it had "Collins" stamped on it.

There was a small monastery close to the German families with about six monks. They had a school for children of the German families. Once a year, the German men would take their coffee out to the end of the road from civilization down into the jungle. The German Embassy in Lima would have made arrangements to buy all the coffee that the homesteaders wanted to sell. The wives and children of the German families never went out to the tiny village at the end of the road.

Another time Wilhelm invited me to ride my horse 50 miles to a large hacienda in the mountains downwind from the copper smelter at La Oroya. The Indians who lived in this area had complained that the fumes from the smelter were killing their cows and sheep. In order to avoid further lawsuits, the Cerro de Pasco Copper company had bought a lot of land with these cattle and sheep from the Indians. The Hacienda manager was a Swiss named Max Von Bergen. Max was about 30-years-old. He had been in the Swiss Army for the normal training and of course had the rifle that he had trained with. He had invited Wilhelm to go on a hunting trip to try to find and kill a vicu–a. The Llama is a beast of burden like a mule, alpacas are raised for their wool, and it has been illegal since before 1500 to kill wild vicu–as who are sort of smaller

cousins and live at higher altitudes than the others. When the Spanish soldiers arrived about 1500, they found that only the Inca royal family was allowed to wear clothing made from vicu–a wool. When I was there in 1939, it was illegal to kill vicu–a, but the poachers who did so would bribe the warden of a prison in the mountains to make women prisoners make vicu–a wool to knit into scarves and sweaters.

I don't believe in hunting myself, but it was such an unusual experience I was glad Max had invited us. We were probably above 17,000 feet and it was snowing lightly. Max had four Indian shepherds with him. They spotted several vicu–a about 300-yards upwind of us. Max, Wilhelm and I dismounted and Max got one of his Indians to hold the horses and Max's dog. We slowly went closer to the vicu–as and finally crawled for fifty yards or so. Max was an excellent marksman and shot his vicu–a at a distance of 150 yards. The Indians took the body back to the Hacienda to skin it and distribute the meat to all of the Indian families.

Max had about 10,000 sheep, more than 1,000 cattle, and a beautiful dog. Apparently it was just a mongrel but Max had trained it to obey every command. I was surprised that the dog only understood German and would not respond to any commands in either Spanish or Quechua.

About June, 1940 Mrs. Ledig and her teen-age daughter Ruth arrived in Huancayo. Mrs. Ledig had not come earlier with Paul Ledig because they wanted Ruth to graduate from high school. In retrospect, it probably was a bad decision for Mrs. Ledig and Ruth to have come at all, because it turned out that Mrs. Ledig was planning to divorce Mr. Ledig. Furthermore, here was an 18-year-old girl, two hundred miles from civilization (Lima). She was pretty lonely. All observers were supposed to go down to Lima at sea level for a week every six months. Mr. and Mrs. Ledig and Ruth did this, and Mrs. Ledig and Ruth made some extra trips so she eventually met some young Americans at the Embassy. Her mother met some families at the Cerro de Pasco copper smelter about

ninety miles north of Huancayo on the road to Lima, and they got invited to some Fourth of July parties, etc at La Oroya.

I was a little lonely myself after Bill Culmsee went to England. I had bought two phonograph records on my first trip down to Lima to get out of the altitude, and I would play my records again and again. I also did some amateur radio operating but my Morse code wasn't all that fast to be comfortable holding long conversations. I had met an American girl at the Embassy in Lima. Her mother was Peruvian so I quickly learned the local customs. Since Peru was the most Spanish of all the Spanish countries in South America, a man could not take a girl anywhere without a chaperon. If I wanted to take her out to dinner or to the movies, I would have to invite an older brother or an aunt to come with us. One could never be alone with a girl. Furthermore, if one saw the same girl more than about three times, her father would make a point of meeting you the next time to discuss whether you were serious or not and whether the possible wedding should be in June or July.

Wild horses for sale at the horse fair at Huancavelica, Peru in 1940.

Of course young Paul and I would ride horses twice a day. On most weekends, Wilhelm would come out to ride his horse, Brownie. He had bought Brownie for a bargain since the Peruvian Army had sold him to get rid of him. He had a bad habit of bucking his officer rider off. Wilhelm had asked me to keep him and ride him a little every day so that he wouldn't buck him off on Saturday or Sunday. Wilhelm paid for his feed. Wilhelm had a friend in Lima who gave him some polo mallets and polo balls. We tried to teach ourselves how to play polo. Our games would usually end prematurely when Brownie got tired of having a polo mallet whistle by his ears and started bucking. We then turned to amateur steeple chase riding. We laid out a short course including jumping over some low (very low) stone walls and across some narrow ditches, etc. And young Paul and I even made a cowboy movie. We didn't have a movie camera, of course, so we would take a series of photographs of the key events in

the plot. Paul always wanted to be the hero, and I was elected to represent the villains.

I did meet Helen, an American nurse at the copper smelter's hospital. I was keeping Wilhelm's horse, Brownie who was pretty wild. One day Brownie tried to jump out of his stall. There was a half door on each stall so that the horses could look out. Horses are very gregarious. When they are let out they all congregate in the same corral even if there are two more corrals with better grazing. Brownie saw the other horses go out so he tried to jump out to join them. He didn't make it and apparently it was painful for him to be half out. I heard all this screaming and joined Pedro who had just arrived with a crowbar to knock the door off its hinges. I must have been too close, because Brownie took a bite out of my leg. I ended up in the hospital for three weeks with this bad leg wound. There were three nurses at the hospital — two rather ancient ones and Helen Germshausen, fresh out of nursing school. There were about forty batchelors at the smelter so she was very popular at these Fourth of July dances. She was actually going with John Coyle when I met her.

There were two doctors at the hospital — both alcoholics and popularly known as state-side rejects. The person in the bed next to me was a miner whose leg had been broken in the main Cerro de Pasco copper mine when part of an improperly shored roof at the 1,000-foot-deep level had fallen on him one night. His team had managed to get him out and rushed him fifty miles down to the hospital. The duty doctor had been drinking at the bar but came to the hospital to set his leg. He must have been drinking too much because an x-ray the next day showed clearly that the leg was not set properly. They took off his cast and broke his leg to attempt to set it correctly. The next day's x-ray showed that they still didn't have things right. The third attempt was apparently done properly. I was lucky that all the doctors were trying to do was to cure the infection in the hole in my leg. I had a scar there for years.

Tom and John had invited me to come up to Oroya for some big dance–Empire Day (British) I think. It lasted all night and

they served us breakfast at 6 AM. We decided to change clothes and go for white water rides in my foldboat. We drew straws and I won. The prize was to go first and to go with Helen. Tom Terry drove my car to watch us fly down the river since the road was right next to the river. Helen and I went about two miles and then found a convenient sheltered place to pull in on the side of the river next to the road. Helen and I got out and gave our life preservers to Tom and John. They had gone about two miles when they saw a big rock the size of an 18-wheel trailer in the middle of the river. What they couldn't see was the whirlpool downstream of the rock. When the foldboat encountered the whirlpool it immediately rolled over. Both Tom and John managed to get out of the upside down boat (losing the safety apron). Tom was a strong swimmer so he struck out for shore and managed to get the currents to help him reach shore about 200-yards downstream. John stuck with the boat and managed to get it wedged between another big rock and the side of the river across from the roadside about a mile downriver. We tied a life preserver to a long line and tossed it into the river. Fortunately the currents pushed it over to the far side of the river where John Coyle was able to snag it. The three of us were then able to pull the boat out into midstream so that the currents could push it over where we could catch it. Too much excitement for me.

I had to eat three meals a day with the Ledig family. I guess that I gradually began to enjoy female companionship even though Ruth and I apparently didn't have many common interests. Perhaps two years of a lonely existence had caught up with me. Anyhow, I proposed to her in December 1941 and she accepted. I didn't realize then that each of us was doing something for the wrong reason — I because of loneliness and she because she was desperate to get away from such an isolated location. I didn't realize that she was using me.

Furthermore, a big event happened which changed my life and turned the world upside down. The Japanese Navy attacked the U.S. Navy at Pearl Harbor on December 7, 1941. I immediately cabled the Carnegie Institution in Washington that

I resigned and was returning to the States to go on active duty. I had taken Reserve Officer Training for three years in high school and four years in college and had received a commission as a 2nd Lieutenant in the Army Signal Corps, Officers Reserve Corps. In retrospect, my impetuous cabling and resigning was a stupid thing to have done. Congress eventually passed a law which said that anyone volunteering or being drafted would be automatically guaranteed a job with his former company after the war was over. I had burned my bridges.

There was an important medical event in my life in the middle of December. The blood stopped circulating in my left arm. The observatory folks hired a taxi to rush me the 150 miles down to sea level at Lima to put me in a small hospital run by some American missionaries. The doctor in charge had trained at Johns Hopkins, but admitted he had never seen anyone with weird symptoms like mine. He wrapped my arm with hot towels and kept it elevated, but said he didn't know of any medicine which would get the blood circulating again. It slowly got better. I was not allowed by the doctor to go back up to the observatory at 11,000 feet altitude.

Ruth and her mother came down to Lima. After I had been in the hospital for almost a month, the last Grace Line freighter on the run from Chile north to New York was scheduled to stop in Callao for a day. Ruth and I were married the day before the freighter sailed for New York. My arm was slowly getting better, but my doctor told me to keep my arm in a sling and elevate it on a couple of pillows at night.

So my two and a half years in Peru ended with a lot of excitement — my unexpected altitude illness which ended my career at the 11,000 foot Huancayo Magnetic Observatory (the observatory is still functioning today, the Carnegie Institution transferred it to the Geophysical department of the Peruvian government); the beginning of World War II for America; my resigning from the Carnegie Institution of Washington to go on active duty in the Army since I was a reserve officer; and my hasty marriage to a teenager. Wow!

Thunderstorms at High Altitudes in the Tropics

Note on Thunderstorms at High Altitudes in the Tropics
R. C. Coile* and W. Culmsee**

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Compilation of some of the thunderstorm data of the Huancayo Magnetic Observatory has revealed some interesting points of comparison with the data published by C. E. P. Brooks on the distribution of thunderstorms over the globe.[1] Meteorological data for the years 1931 to 1939, inclusive, were examined to determine the number of thunderstorms recorded during each month. The data for 1933 were not used in the final analysis, for the unusually low number of thunderstorms recorded in that year looked obviously due to poor observational technique.

Table 1 contains the tabulations of the number of days when thunder was heard in each month for the period 1931 to 1939. The total number of thunderstorms for each year is also given. The eight years of data, excluding 1933, have an average number of storms per year of 105.2. Dr. Brooks had computed an average number of 42.6 thunderstorms occurring in a year in the district–Brazil, Bolivia, and Peru.

Figure 1 presents a curve of the annual variation of frequency of thunder at Huancayo, Peru (latitude 12° 02.7' south and longitude 75° 20.4' west), as computed from the eight years of data tabulated in Table 1. For comparison, the curves of annual variation of thunderstorms at Quito, Ecuador (latitude 0° 14' south and longitude 78° 45' west), and Brooks' district of Brazil, Bolivia, and Peru have also been plotted. It is interesting to note how different are the curves for Quito and Huancayo. Quito, altitude 9,350 feet, with an average of 99.5 storms per year, was the only meteorological observatory listed for the Andes or for the whole west coast of South America for that matter. However, the data of Huancayo, altitude 11,000 feet, does not have the characteristics of such sharp peaks as recorded in April and October at Quito.

The whole question of meteorology at tropical high altitudes needs a great deal of investigation. Dr. Brooks wrote, 'There is very little information readily available for variation of thunder frequency with height in the tropics, since the stations are rarely sufficiently close together for other factors to be eliminated.'

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[1] C. E. P. Brooks, The distribution of thunderstorms over the globe, London, Met. Office, Geophys. Mem., No. 24 (1925).

Chapter 5
World War II — 1942 to 1946

Ruth and I managed to get aboard the last Grace Line freighter returning to New York from Chile and got to New York City two weeks later. The trip was exciting since we steamed at night with no lights showing and no navigation lights. Apparently, there were German submarines on the East Coast sinking American ships off the New Jersey coast.

We were glad that the ship reached New York City without any problems. We took the first train we could to Washington and checked into a hotel. I then took a taxi to the War Department Building on Constitution Avenue and checked in with Major K.B. Lawton, my ROTC professor at MIT who was now a Lieutenant Colonel in the Office of the Chief Signal Officer. I had cabled him from Peru that I was coming back to the States to report in for active duty. I took the Japanese attack on Pearl Harbor very personally. My father was a Coast Artillery soldier, stationed at Fort Kamehameha at the mouth of Pearl Harbor. We had lived there from 1929 to 1933 while I was going to McKinley High School in Honolulu. LtCol Lawton had already prepared a draft of orders putting me on active duty. I took a taxi to Raleigh Haberdashers where I bought a uniform, shirts, shoes, socks, etc. They hemmed the pants while I waited.

The next morning I reported in to the Officer of the Chief Signal Officer — the headquarters of the Signal Corps wearing my new uniform. They told me that I must go to Walter Reed Army Hospital out on Georgia Avenue for a physical exam. I took an Army bus out to the hospital and reported in to the reception office. They gave me directions and some forms to fill out and I walked down miles of halls to find the physical exam rooms. There were about 100 of us. We took our uniforms off, and were told to line up in a formation of two lines. The doctors looked at our forms and then looked at us and then

listened to our lungs and heart with a stethoscope. We had to provide all sorts of details of our childhood diseases such as chicken pox, measles, mumps, etc. They then asked us how we felt. We each replied, "Fine, Sir." After a dentist examined our teeth, we were all accepted. That was it. It didn't take long.

The odd thing was that I threw the sling away forever the day I reported for active duty and told that white lie to the doctor, "I'm fine, sir." I didn't want to be rejected for active duty. I guess we were all super-patriotic in those days. "Remember Pearl Harbor" was the national war cry.

The statistics of the draft are interesting. I have read that during World War II, there were 13 million men between the ages of 18 and 36 drafted. There were educational requirements: one had to have completed the fourth grade. There were physical requirements such as 6 teeth that met, height at least 5-feet but less than 6-feet 6-inches, and a minimum weight for each height. Then there was a 30-minute psychiatric exam with questions such as, "Do you think that you can sleep on the ground in a two-man pup tent without your mother tucking you in?" Five million were rejected for being unsuitable for combat for physical, educational, or mental reasons.

The next morning, I went back to OCSigO Personnel office in uniform and picked up my orders which LtCol Lawton had the right folks sign.

LtCol Lawton asked me to go to T-26, a temporary office building on Constitution Avenue near an old brewery (where the Kennedy Center is now) and pay my respects to LtCol Tom Rives, head of the Research & Development Division. My orders had assigned me to the Signal Corps Laboratories at Fort Monmouth, New Jersey, since LtCol Lawton had discussed my background in Army ROTC at MIT and my civilian experience at the Huancayo Magnetic Observatory measuring the height of ionosphere layers. The ionospheric research was in some respects similar to the secret radar (radio direction finding and ranging) research at Fort Monmouth. LtCol Rives asked if I would be willing to have my orders changed to assign me to duty in his Radar Branch in Washington rather than

going to Fort Monmouth. He explained that in pre-World War II days, it was War Department policy not to order 2nd Lieutenants to duty in Washington without their permission as it was deemed too expensive for them to live there on their pay scale. Apparently the US Navy had the same sort of policy since Annapolis Naval Academy graduates were ordered to some battleship or cruiser and forbidden to marry for three years after graduation so that they could pay off their debts of buying summer, winter, and dress uniforms. I told LtCol Rives that it would be fine with me since my father and mother lived in Hampton, Virginia about 200 miles away.

Ruth and I looked at the advertisements in the Washington Post to find an apartment to rent. We were lucky and found a small apartment at 1905 K Street NW with an affordable rent. It was in an old brick building with a plumber's office on the first floor and his workshop in the basement. We rented the second floor which had a living room, bedroom, bathroom and kitchen. We spent Saturday buying furniture at the Salvation Army store.

LtCol Rives told me that the most important program in the Radar Branch was a secret project called "Identification, Friend or Foe" (IFF). He had decided to put me in charge of the IFF unit. The other vacancy was in radar countermeasures. Countermeasures wasn't considered important in those early days. This was rather shortsighted since it turned out that countermeasures became tremendously important two or three years later when the Army Air Corps began flying B-17 and B-24 bombers over Germany. The Germans had radar controlled anti-aircraft guns. Harvard's countermeasures laboratory and Signal Corps production of radar jammers became essential.

The Communications Branch was across the hall. Second Lieutenant Bill Hewlett (MIT S.M. 1936) was the project officer on the SCR-522, a VHF voice communication radio for aircraft. There were no voice aircraft radio transmitters before the war. The pilot in a single-seat aircraft had to send signals in Morse code using a telegraph key strapped to his leg. That explained

why so many messages were terse. The classic message was from a Naval Pilot who sent the famous message "Sighted Sub. Sank same." Large planes had a radio operator to send and receive messages using Morse code.

The War Department was expanding from pre-war strength of about 350,000 men to the wartime requirement of 8 million. Someone decided that more officers were needed as soon as possible. Reserve officers had been called to active duty "for the duration." An order was issued that officers must have six weeks in grade before being promoted instead of the pre-war practice of keeping officers at the same rank for three years or more before promoting them. Bill must have come on active duty about the same week that I did, because we were both promoted to First Lieutenant after six weeks on active duty. Then someone else decided that that order was insane and a new order came out that officers had to be six months in grade before being promoted. Sure enough, we were both promoted to Captain, Signal Corps Reserve after precisely six months. However, I remained a Captain for the next three years. Bill Hewlett was transferred to a special job in the New Developments Division of the War Department's General Staff where he was promoted and stayed there until the end of the war in 1945.

I was assigned to be a courier one day. The Chief Signal Officer had asked the British if Robert Watson Watt (later Sir Robert Watson Watt), who had invented radar for the British, would make a survey of all installations in the United States of the SCR-270 radar. The one on the island of Oahu in the Territory of Hawaii had detected the Japanese formation of more than 100 carrier-based bombers at a range of about 130 miles as they were approaching to bomb Pearl Harbor. None of the other SCR-270s seemed to be working. Watson Watt was flown to the Panama Canal Zone and then to other locations on East, Gulf and West Coasts to inspect the sitting of the SCR-270. His SECRET (big deal in those days) report was very critical. He found that almost all the SCR-270s were put in the wrong place for a radar antenna. They had been

installed in some convenient spot with no thought as to the harmful effects of radar ground clutter on detection. I was ordered to take the secret report to the Signal Corps Radar Lab at Fort Monmouth, New Jersey. I went to the Armory and checked out a .45 caliber pistol and a special brief case which was chained to my wrist to carry the secret report. On the train to New York, it was just my luck to be approached by a young Russian officer in uniform. It turned out that he wanted to practice speaking English with me (the Russians were supposedly our allies, sort of). Initially I was petrified until I realized he just wanted to practice talking. After we completed our friendly conversation he showed me his officer's swagger stick. It actually was the scabbard for a cleverly concealed dagger just an inch shorter than the stick.

I had to work twelve-hour days, seven days a week as the IFF project officer. Poor Ruth had to take care of herself, but she had grown up in Bethesda and she did have her Bethesda high school girlfriends.

Everything about IFF was secret. Actually, both the Americans and the British had developed secret IFF systems without telling the other. The Signal Corps had General Electric design and build a secret identification set called SCR-515. (Set, Complete Radio, number 515). The system had been tested but not put into production. The British had designed an identification set which they called IFF Mark II. The British persuaded the IFF Committee of the Combined Communication Board to have the Americans manufacture this British design for all Royal Air Force, American Army and Navy Aircraft. The Signal Corps selected Philco in Philadelphia, a pre-war manufacturer of home radios, to produce the IFF Mark II. The American copy was called SCR-595.

The British had already designed and built models of an improved IFF Mark III. They persuaded the Americans to build a copy of this airborne transponder now called SCR-695. An interrogator's antenna was mounted on the ground or ship radar's antenna. When a strange new blip appeared

on the plan position display, or "scope," of the ground or ship radar, the operator would send a challenging signal. The receiver in the airborne transponder in a friendly airplane would automatically trigger a transmitter to send a "friend" response which would appear as a display of little dots behind the blip on the screen. The radar operator would then know that the strange blip was a friend and not a foe. The British terminology of friend or foe, interrogator and transponder was adopted.

Radar Research and Development

Things were really hectic in 1942. One of my projects was a new interrogator antenna to be mounted on the antenna of all SCR-270 radar (the radar which detected the incoming Japanese formation approaching Pearl Harbor). The first model was ready for testing. I asked the Aircraft Radio Lab at Wright-Patterson Airfield in Dayton, Ohio if they would assign an aircraft in which the Naval Research Lab could install an airborne transponder to run acceptance trials. They replied that they were busy, had no spare airplanes, but could do the testing in about four months, maybe. My boss went ballistic and told me to get it tested next week somehow.

After the war started in December 1941, the Army Air Corps had commandeered all civilian general aviation airplanes. Bolling Field in Washington had more than 100 airplanes just parked there waiting for someone to figure out what to do with them. The owners had flown them there to turn them over to the Air Corps. Maintenance people started the engines once a week just to keep them in operational condition. I went over to Bolling Field and spoke to the right people. I explained that I was the project officer on a new secret IFF antenna. We needed an airplane for a couple of days to fly up to Fort Monmouth, New Jersey. The actual flight test would be from Sandy Hook, New Jersey out over the ocean to a distance of 100 miles to determine whether or not the new antenna worked. An officer was assigned to help me. He showed me a Grumman amphibian airplane called a Widgeon. It was a seaplane with a float hanging down from

the wingtip on each side. He told me that they had three of these seaplanes. I asked about a pilot who could fly our test mission. He asked around and found an Air Corps pilot friend in headquarters who thought he could get a couple of days off to fly for us. The only problem was that his friend had never flown a seaplane. The solution to that was to get one of the senior pilots at Bolling to check him out. The first check ride was a disaster. They were planning to do three water landings, but the third one had a cross wind and the wing was not level when they tried to land. The float about five feet inboard of the wingtip hit the water and broke off. No problem, they started over in a second Widgeon. They had a good water landing so they moved on to practice landing on the runway with the amphibian's wheels. This time, again they had a crosswind. The plane drifted over to the side of the runway and a wing float hit a runway light and broke off. No problem, they started over in the third Widgeon.

Well, when the pilot was finally checked out, he had to fly from the Army Air Corps' Bolling Airfield to the Navy's Anacostia Naval Air Station. It seems strange now, but the Navy field and the Army field actually were next to each other, but there was no common runway, and no way a plane could taxi from one field to the other. When the plane arrived at Anacostia, the Naval Research Lab installed the airborne transponder. The NRL electronics technician and I flew in the passenger compartment of the amphibian's hull and we took off. We got to Fort Monmouth and actually to Sandy Hook. At that point, the pilot told me that the weather was turning bad and that he refused to fly 100 miles offshore in bad weather. I persuaded him to go just five miles offshore since he could still see land and we tried to see if the experimental model IFF antenna installation worked. It didn't work! So, the test was successful in demonstrating that the antenna didn't work and we did not need to go 100 miles offshore after all. I wrote all this up in a report and recommended that the antenna contract be cancelled, which happened. The company that had built the antenna was very angry to have its contract cancelled. I

found out after the war that this company had blacklisted me and told a number of other companies that they were not to hire that S.O.B., Coile, if he came looking for a job.

The whole idea of an identification friend or foe system was secret. It was decided that no workable airborne transponder should fall into German hands if a RAF or American plane were to be shot down. As it turned out, hundreds of RAF and American aircraft such as B-17, B-24 and P-51 were shot down. The Signal Corps asked the Army's Picatinney Arsenal, in New Jersey to design and build a little explosive device which was mounted inside the case of each SCR-695. If the B-17 was shot down, the pilot, if he were still alive, could push a special red emergency switch on the instrument panel to blow up the IFF set. This assumed he had time to do this before he jumped out of the plane with his parachute. If the pilot and copilot were killed in flight, there was a backup system of an accelerometer inside the aircraft which would activate a switch to blow up the set when the plane crashed on the ground. I was invited to observe the test of this explosive at the Naval Research Lab. We were on the roof of one of the lab buildings because the explosive was not supposed to go through the case. As it turned out, the Picatinny Arsenal engineers were very embarrassed when the explosive detonated and the whole box was flung off the roof to land in the street three floors down. The charge was much too powerful.

The British were very anxious to receive the Royal Air Force's share of the SCR-695 airborne transponders which were being manufactured by Motorola in Chicago. As the Army's IFF project officer, I had to give a progress report each month to my boss who forwarded it on to a Major General in the War Department's Supply Service who passed it on to the White House so that Roosevelt could tell Churchill what the status of production was. Our goal was to send several hundred IFF sets to England by the end of December 1942. I was sent to Chicago in December to go to Motorola's factory to get the latest information. Fortunately, the factory was meeting the desired schedule. However, there were complications ahead.

The urgency and pressure on the production workers had apparently not been communicated to the people who were in charge of packing and shipping these important sets to England. They treated this shipment as a routine matter and did not even pick up the equipment from the loading dock for three days. The workers understandably got upset at this. Someone finally found out about this and the shipping people rushed over. The next mistake was that they put all the sets together and put them on a single ship instead of sending half of the sets on one ship and the other half on a different ship. A German submarine sank the ship with all the IFF sets and of course, it took some time to sort out that that was the reason the sets did not arrive in England on schedule.

Dinner with Enrico Fermi

An interesting thing happened to me on that trip. Professor Arthur Compton, University of Chicago (Nobel Prize in Physics in 1927 and brother of Karl Compton, President of MIT) had visited the Huancayo Magnetic Observatory in July 1940 in connection with his cosmic ray research to see if his apparatus that he had given to the Observatory was working properly. Mrs. Compton had invited me to call her if I ever got to Chicago. After visiting the Motorola factory to check on the IFF production, I had telephoned her to say hello. She told me that it was Arthur's birthday and invited me to his birthday dinner that very night. When I arrived she asked me to sit next to an Italian lady, Mrs. Enrico Fermi who didn't speak much English. Mrs. Compton thought I might be able to converse with Mrs. Fermi in Spanish. Everyone was in high spirits at the dinner. It was years later that I found out that that they were actually celebrating the successful beginning of the atomic age on December 2, 1942. Dr. Enrico Fermi (Nobel Prize in Physics in 1938) had assembled thousands of graphite blocks and uranium pellets into a reactor called Chicago Pile Number One. The world's first self-sustaining nuclear chain reaction took place on a squash court under the stands at Stagg Field at the University of Chicago.

Speaking of Nobel Prize winners, as part of my job during the war I used to go to Cambridge, Massachusetts to the Radiation Laboratory at MIT in connection with their research for the Signal Corps on IFF and beacons. The head of this section was Luis Alvarez who won the Nobel Prize in Physics in 1968. Dr. Alvarez was at the Radiation Lab from 1940 to 1943. He went to England in 1943 with the first Ground Controlled Approach blind landing system. The RAF project officer was a Flight Lieutenant Arthur C. Clarke, who later became famous for proposing satellites for communications. Dr. Alvarez returned to the States after the GCA system was installed and was sent to the Manhattan Project at Los Alamos where he designed the detonators for the plutonium bomb. Actually, he flew in a specially instrumented B-29 on both the Hiroshima and Nagasaki missions in order to measure the size of the atomic bomb explosions.

The British Telecommunications Research Establishment, Great Malvern had already begun research on the next generation of IFF called the IFF Mark V. A special British/ American group called "Combined Research Group" was established at the Naval Research Lab headed by Dr. Cleeton, NRL and Rennie Whitehead, TRE. I was one of only five Americans who were given special security clearances to visit the group and observe their progress. Actually, the war was over before the development was finished, however this was an important step in the post-war development of the IFF Mark X (spoken as "X" and not the Roman numeral ten) which became the Air Traffic Control Beacon System now known colloquially as the transponder and installed in virtually all aircraft flying in the world from huge airliners to small single-engine planes.

One more word on IFF. All of these systems actually identified friends. This meant that the pilot had to turn his IFF set on and the IFF airborne transponder had to work. On the other hand, the MIT Radiation Laboratory just before the end of the war had actually designed a set which identified "enemy" aircraft. This equipment, called Black Sambo, analyzed the

modulation of radar pulses returned from Japanese propeller driven aircraft to an American night-fighter's airborne radar. It could determine that these Japanese pulses were different from the pulses returned from American aircraft. The war ended and so did the development.

The Signal Corps was finding it difficult to design and manufacture all the different communications and radar equipment needed by the Army's infantry and artillery units, plus all the equipment for new types of fighter and bomber aircraft of the Army Air Corps. One of the problems was nomenclature. The pre-war system of just assigning a number to new equipment did not provide any information as to what type of radio or radar it was, or its use, or was it hand held, carried in a truck, tank or aircraft, etc. The Army Air Corps had assigned a liaison officer to the Signal Corps' Research and Development Division to keep the Air Corps informed of developments of interest to them. He found it difficult to keep up to date on more than 700 different pieces of equipment. I only had a few IFF sets so that I knew what my SCR-515 was and the SCR-695 was. He designed a completely new system to cover Naval equipment as well as Army equipment. In his new Army/Navy system everything looked like this: A/N APR-1. After the Army/Navy initials, this first letter A was for airborne equipment, G would be ground, S would be ship, etc. The second letter P stood for radar, C would be communications and so on. The third letter R stood for receiver, and T would be transmitter. The number 1 indicated that this equipment was the first of this type. Fortunately, everyone recognized the advantages of a sensible system like this and it was quickly adopted.

The Pentagon

When this new nomenclature was being adopted in early 1943, our Signal Corps offices were located in temporary buildings at Fort McNair. We were transferred to the new Pentagon in May 1942. The first side of the Pentagon contained the bus arrival lanes in the basement, a concourse on the first floor and cafeterias on the second floor. When the second side

of the Pentagon was finished in April 1942, Army Ordnance moved in, with the Office of the Chief Signal Officer arriving in May 1942. The Pentagon was and is such an unusual structure that a few words about it may be of interest. In the summer of 1941, approximately 24,000 War Department personnel were working in more than 20 separate buildings. The Army suggested building a single new structure to shelter as many as 40,000 federal workers. Roosevelt agreed and Brigadier General Somervell, Chief of Construction, Quartermaster General contacted the chair of the appropriate congressional committee to pave the way for this reorganization.

On July 17, 1941, a Thursday, BGen Somervell addressed the House Subcommittee on Appropriations and was told by its chairman, Virginia Representative Clifton A. Woodrum to develop a proposal. On Tuesday, July 22, Somervell presented the proposal to Woodrum's committee. The concept was approved by the House on July 28 and the Senate on August 14. Roosevelt signed the bill on August 25. The preliminary plans were created in 34 days. To accomplish this, the chief architect's office grew to 327 architects and engineers, supported by 117 field inspectors. Detail prints came out of at the rate of 12,000 to 30,000 a week.

From approval by Congress until the ground breaking took only 29 days. Then 15,000 construction workers worked three shifts, seven days a week with floodlights for night work. The construction of the largest low-rise office building in the world took just 16 months under wartime conditions of labor and material shortages. There was no steel for elevators so ramps and stairs were installed between the five floors.

I worked for 17 years in the Pentagon — three years on Army active duty from 1942 to 1946 and 14 years as a civilian working for the Navy Department on Office of Naval Research grants to the Mathematics Department at MIT which I shall describe later. I found the Pentagon to be an interesting place.

A history of the Pentagon presents some interesting facts and dates:

Prime contract awarded: August 11, 1941
Mechanical engineering contract awarded: September 3, 1941
Construction began: September 11, 1941
First occupants move in: April 29, 1942
Construction completed: January 15, 1943
Total Land Area: 583 acres
Cost of Land: $2,245,000
Area covered by Pentagon building: 29 acres
Parking space: 67 acres
Capacity: 8,770 vehicles
Total cost of project: $83,000,000 (1943)
Floor area: 3,705,793 sq ft
Length of each outer wall: 921 ft
Height of building: 77 ft
Total length of corridors: 17.5 miles
Special construction features: Because the area was a swamp, the building rests on 41,492 concrete piles

Operation Aphrodite

Another important project of mine in 1944 was with the General Instrument Company in New Jersey. They were building a radio transmitter which could be mounted in a bomber aircraft to send up/down, right/left control signals to a receiver in another aircraft flying in formation with it. The US Navy had a squadron in England of B-24 type aircraft which the Navy called PB4Y-2. Someone came up with the idea of guiding a radio-controlled aircraft loaded with explosives across the North Sea from England to Germany. The control aircraft would steer the drone into a dive on a V-2 launching site. These drone aircraft were called "Weary Willies" because they were deemed to be too dangerous for any further operational missions because of damage from German anti-aircraft artillery or just plain old age. However, the scheme in "Operation Aphrodite" was to repair them for one final kamikaze dive into a difficult target — a V-2 launching site. Lt Joseph P. Kennedy, Jr., USN, was a navy pilot who had volunteered for one of these missions. Joe was the drone's

pilot and the co-pilot was an expert on radio control projects. On August 12, 1944 the drone and its "mother" control plane took off. Joe's drone was loaded with 21,000 pounds of a new experimental explosive called Torpex. The procedure was for the two planes to fly in formation until the mother plane had achieved complete control over the drone at the desired cruising altitude and heading towards the target. Then, Joe and co-pilot would jump out of the drone PB4Y-2 and parachute down to safety while the mother plane controlled the drone all the way across the North Sea and dived it into the target. Unfortunately, there was an explosion onboard the drone before they were ready to jump out and both Joe and co-pilot were killed.

Lt. Joseph Kennedy was posthumously awarded the Navy Cross. In 1946 a destroyer, the USS Joseph P. Kennedy, Jr. (DD-850) was launched in his memory, on which his younger brother, Jack Kennedy, briefly served.

It is worth noting, the German V-2 attacks on England began in September, 1944. 518 V-2s hit London between September 8, 1944 and March 27, 1945. There were 21,380 civilian casualties of killed and wounded and 20,000 houses destroyed.

On April 19, 1944 I qualified on the rifle range as sharpshooter on the U.S. Carbine, caliber .30, M-1. On August 25, 1944, my Army Air Corps friends arranged for me to attend a five-day "Staff Officers Course in Airborne Radar" at Langley Field, Virginia. Unfortunately, after two days my Signal Corps boss had me recalled to the Pentagon to prepare a report that he was incompetent to do. It was a nothing-type project and I was disappointed that I missed out on the actual flying days of the course.

Radar Bomb-Sight Simulator

Later in 1944, I was the Signal Corps project officer on another important equipment project — the training device for radar bombardiers. The Radiation Laboratory at MIT had developed a radar bombsight for B-17 and B-29 aircraft called the A/N APQ-13. Bell and Howell in Chicago had been given

a contract by the Signal Corps to develop and manufacture a radar trainer for bombardiers who were now going to have the A/N APQ-13 bombsight in addition to their Norden optical bombsight. This trainer was a tank approximately four-feet by six-feet filled six-inches deep with water. The bottom of the tank was a piece of glass. An enemy target area would be built up by putting sand to simulate land, small metal blocks to simulate buildings, and the glass would simulate rivers, lakes or ocean water. Small metal strips across the glass rivers would simulate bridges.

A small sonar transducer mounted on a movable carriage was suspended two inches in the water. The radar bombardier's display was thus provided with a reasonable authentic looking depiction of what the actual radar would see if the aircraft were approaching Japan from the ocean and looking for the intersection of ocean and land. If a river ran through a city, the sonar transducer would show the river and also the pretend bridges across the river. The radar bombsight was an essential backup to the optical Norden in case clouds made it impossible for the bombardier to see anything through the Norden. My counterpart project officer in the Army Air Corps, Major Ken Caird innocently asked his boss why this project was so important. His colonel told him that there was a super secret program with the codename SILVERPLATE associated with the Manhattan Project. He further said, "That's all you need to know. If I hear you trying to get any further info, you'll be court-martialed." Months later we found out that that SILVERPLATE was Colonel Paul Tibetts' 509th Composite Bombing Group which dropped the first atomic bomb on Hiroshima, and that the Manhattan Project was the Los Alamos bomb making laboratory.

In early 1945, the Army Air Corps went to War Department Secretary Stimson and told him that the performance of the Army Signal Corps was completely unsatisfactory in the design and manufacture of airborne communications and radar equipment. They requested that the Air Corps be given complete responsibility for all aspects of their own radio

and radar equipment. They requested that the Signal Corps transfer to the Air Corps those officers who had been working on Air Corps programs. They also requested that the Aircraft Radio Laboratory at Wright-Patterson Airfield, Dayton, Ohio be transferred to the Air Corps. Secretary Stimson found these allegations to be true and issued orders to correct the situation.

Thus I was transferred from the Office of the Chief Signal Officer to Headquarters, Army Air Forces on April 1, 1945. Some of the Signal Corps officers who were transferred were somewhat upset by this. "We will be second-class citizens," they complained. "All Air Corps officers are trained pilots and wear wings to prove it," was another common theme. The Air Corps in retrospect did its best to convince us that we were not second-class citizens. A few (very few) were sent to the Tactical Air Force School in Orlando, Florida to take the Radar Bombardier course and receive radar observer wings. Years later, one (and only one) of our group of former Signal Corps officers (Pete Sandretto) was promoted to Brigadier General. He had been in charge of radio communications for United Airlines before the war. Some of us with advanced engineering degrees were put in research and development jobs since the great majority of Air Corps officers had only two years of college before becoming aviation cadets and taking flight training. I was eventually promoted to the rank of Colonel. Now you can appreciate why I believe in miracles.

Howard Hughes and the Spruce Goose

After three months in Air Force headquarters, I was assigned to be the project officer on several guided missile projects. My Colonel suddenly received orders to go to California and inspect Howard Hughes' Spruce Goose. Hughes had received government financing of $18 million to build this wooden flying boat. President Roosevelt personally had ordered the Household Finance Agency to provide Hughes with the money. Now Hughes had asked the government for about $4 million additional money to finish construction. The Army Air Corps was asked to send an expert out to see

what was going on. My Colonel had been the test pilot on the B-19, the largest experimental bomber the Air Corps had ever built. It had been decided not to build the B-19 but build the smaller B-29 instead. The Colonel was going to fly his own twin-engine plane to California. Since it could carry four passengers, he invited me and another Captain to come along plus his secretary who was in the Women's Army Corps.

We departed from Bolling Field in Washington on July 2, 1945. We stopped overnight in Wichita, Kansas. The next day we went to Wendover Field in the northwest corner of Utah. I was the project officer on AZON (azimuth only) radio controlled bombs. A 2,000 lb bomb had a special tail assembly with a smoke generating flare, a radio control receiver and moveable tail fins. On July 4, we observed some trials of AZON bombs. When the test plane, a B-17 dropped one AZON bomb at its 20,000 foot altitude above ground our observer group could see the smoke flare almost immediately. The B-17 bombardier could give right or left signals to the bomb with his radio control transmitter. The bomb could be controlled in azimuth only so that it could hit near a railroad line for example, if the airplane was flying parallel to the tracks. A potential miss of several hundred feet could be corrected so that the bomb (filled with sand) would impact within 50 feet of the target in the trials we observed.

Incidentally, Wendover Field had just a few planes and research people there when we arrived on July 3. We found out later that Col Tibbett's and his 509th Composite Group of 15 B-29s had arrived at Wendover on June 14 and had all packed up and left on June 27 to go to Tinian Island. After they arrived at Tinian on July 2 they flew practice bombing and night orientation missions until July 22, and combat bombing missions on July 24 and 26. After flying one atomic bomb practice mission on July 31 they waited for President Truman to give them the order to bomb Japan. On August 6 the Enola Gay dropped the Little Boy atomic bomb on Hiroshima. The Little Boy was 12 feet long and 28 inches in diameter and consisted of a Naval 5-inch gun charge which fired a slug of

uranium 235 down a barrel into another piece of uranium to achieve critical mass and detonate a nuclear reaction.

The cruiser USS Indianapolis (CA-35) dropped anchor off Tinian Island on July 26 to deliver the Little Boy. Five days later on July 29, Japanese submarine I-58 torpedoed the Indianapolis which was sailing in radio silence towards the Philippines. The ship capsized and sank within 12 minutes so that no radio signal about the disaster was sent. Because of communication errors no search action was initiated for some days. There were only 317 survivors after five days in the water out of a crew of 1199. The captain was court-martialed and found at fault for the sinking. He later committed suicide. His son tried for 35 years to have the Navy re-examine the situation with the help of the Japanese Navy retired officers. In October 2000, Congress passed a resolution to clear him of any guilt.

It is of interest that the Little Boy atomic bomb was assembled in flight after takeoff. Many ordinary B-29s had crashed on takeoff even with the 8,500 foot long runway because they were so overloaded with fuel and bombs. No one wanted the Enola Gay to crash on take off with a live atomic bomb and blow up the whole airbase. Navy Captain William "Deke" Parsons, the naval gun expert at Las Alamos was a key person in the design of the Little Boy. He was the weaponeer who assembled the bomb in flight. I was glad that I had the chance to meet Admiral Parsons some years later at a party in Georgetown.

My hostess at the Georgetown party was the grand-daughter of Professor Albert Abraham Michelson, University of Chicago. Albert Michelson entered the US Naval Academy in 1869 at age 17 and graduated in 1873. After two years of sea duty he returned to Annapolis to teach physics. In 1878 he began experiments to measure the speed of light. In 1907 he was awarded the Nobel Prize in Physics — the first American to receive a Nobel Prize in the sciences. Also he was the first and only U.S. Naval officer to ever receive a Nobel Prize in Physics. Former President Jimmy Carter, an Annapolis

graduate and former submarine officer has received the Nobel Prize for Peace. The relevance of all this was that I hired two of Professor Michelsons great-grandchildren, Baba Foster and Jeremy Foster, when I was in charge of a small research unit assigned to the Navy supported by Office of Naval Research grants to the Math Department at MIT. I had a hope that there should be something in the genes — and there was. They were both remarkably bright. They had grown up living in quarters at the Dahlgren Proving Ground where their Naval officer father had been stationed when Lieutenant Commander Parsons and his family also lived there, and that is how we came to be at the same party in Georgetown.

Apparently the radar bombsight was only used for backup on both atomic bomb missions. Three B-29s took off one hour before the Enola Gay and similarly before Bockscar, the bomber that dropped an atomic bomb on Nagasaki, to fly to the target area and observer the weather. They reported back to the Enola Gay that there was three-tenths cloud cover over the target. This was good for the Norden optical bombsight so that the bombardier knew he was bombing the correct target. But I was glad that our radar bombardier training device had been delivered on time to the 509th Composite Group.

We left Wendover the next day and flew to Seattle. My Colonel arranged for the three of us to go for an orientation ride in a B-29 while he had some business with Boeing. Each B-29 had a test flight after it came off the production line in order to be accepted by the Air Corps. I had flown in an experimental B-17E from Wright-Patterson to Toronto, Canada once, but the B-29 was a much larger aircraft.

Our next stop was in Los Angeles for the visit to inspect the Spruce Goose—the purpose of the whole trip. Actually the flying boat was constructed of laminated birch, and not spruce. Some wag had christened it the Spruce Goose. The aircraft's size was unbelievable. The wingspan was 320-feet, chord 51-feet, depth of wing 11-feet with a wing area 11,430 square feet. There were eight 3,000 horsepower engines with

17-foot propellers. Inside the hull one could visualize space big enough for 750 soldiers.

I was very disappointed when we visited Howard Hughes' offices. I had expected to find a bunch of Hollywood's most beautiful secretaries. You can imagine my shock when we arrived and found that the secretarial staff was completely male. I should have known better. When I went to work in 1939 at the Department of Terrestrial Magnetism and Atmospheric Electricity of the Carnegie Institution on Broad Branch Road in Washington, D.C., there was a woman librarian but all secretaries, typists and filing clerks were men.

Howard Hughes never did get any more government funding. He personally kept his cabinet makers busy trying to complete the flying boat. Actually, two years after the end of the war, he took off and flew a mile at a height of about 70 feet on November 2, 1947. He did this with minimum publicity. No one had expected a flight as it was supposed to be taxiing trials. No one knows why the flight was only a mile and in a straight line with no turns. Someone speculated that Howard felt that the controls might not be working as designed and didn't want to try to turn and end up crashing the flying boat.

One of the most interesting events of our whole trip was a visit to Paramount Studios. The Colonel's Women Army Corps secretary arranged through her mother for us to spend the day at the movie studios. Her mother worked for Edith Head, the famous costume designer for Paramount. We were taken all over, ate lunch there and watched a movie being filmed. Alan Ladd was the star. We watched about a dozen takes of the same two-minute scene before the director was satisfied. We were introduced to important people such as Edith Head but not to the actors like Alan Ladd or Ray Milland so that we would not distract them. They seemed to have a difficult time just remembering a minute or so of their lines plus the timing of their movements. No wonder it took so long to film a movie.

We flew from California to Eglin Field, Florida where the Colonel dropped me off and proceeded back to Washington. I stayed at Eglin for three days to observe tests of one of my guided missile projects — the JB-2, an American copy of the German V-1 pulse jet guided missile. The history of the V-1 buzz bomb is interesting. Werner von Braun started research in 1937 at Peenemunde in the Baltic. The first *Vergeltungswaffe* or "vengeance weapon" was a pilot-less aircraft 25-feet long with 17-foot wing span with a 600 pound thrust pulse jet engine. It had a range of about 160 miles at an altitude of 2,000 to 3,000 feet at a speed of about 360 knots with a flight time of about 22 minutes. The flight tests were conducted with Germany's most famous woman glider pilot stuffed into a temporary cockpit to fly the "pilot-less" aircraft. She was tiny weighing less than 100 pounds. The warhead in the nose was about 2,000 pounds. The Germans built 55 launching sites with steam catapults and 157-foot long launching rails. More than 30,000 V-1s were manufactured in a munitions factory inside the Harz Mountains using slave labor from the nearby Buchenwald concentration camp. The D-Day invasion of northern France was on June 6, 1944. Between June 13, 1944 and March 29, 1945, a total of 9,251 V-1s were launched against London. Hitler ordered them all aimed at Tower Bridge as the target. 2,419 made it to London. 2,000 were shot down or overturned by RAF Spitfires placing a wing under the V-1 wing and upsetting the missile with one Squadron Leader ace credited with 59 kills. 1,971 were shot down by the 1,800 antiaircraft guns defending England before the buzz bombs reached London. Another 278 were snagged by cables dangling from the 1,000 barrage balloons used as part of the air defenses.

Engineers designing weapons think only of how well they perform, not how much damage and suffering they may inflict, often on civilians. My wife, Ellen, was in England during the war years and experienced both the V1 and the V2.

The British had an indomitable spirit and made light of many horrendous happenings. Ellen said the V1s were tricky,

because when the engine died you didn't know if the plane (bomb) would drop like a rock, veer right or veer left or just glide straight forward. So the dilemma was: which way to run? The wags named them "Bob Hope" – you bob down and hope for the best.

Ellen remembers when a V2 dropped on the allotments (victory gardens) behind her house. Her mother came to wake her up saying a V2 had just dropped. She said, "So, it dropped already," and turned over and went back to sleep. So from her perspective, although they could inflict more damage, they were easier to take because you didn't have the worry of wondering where they would land.

The British gave the Americans several buzz bombs which had crashed without detonation of the warheads. Air Corps engineers at Wright-Patterson Base prepared reverse engineered drawings and a contract was given to Republic Aviation to build 10,000 airframes. Ford built the pulse jet engines. Production of the JB-2 "Loon" began in January 1945. It was planned to launch them against Japan from LSTs (Landing Ship Tanks). The tests were proceeding ok. I had a bit of luck in getting back to Washington. An experimental B-25J with a 75 mm forward firing gun was going to Wright-Patterson Air Corps base at Dayton and the pilot let me ride in the bombardier's position up in the glass nose. Then I was able to fly from Dayton to Bolling Field on the daily shuttle.

The Adjutant General of the War Department issued an order on August 5, 1942 and a supplementary memorandum of December 5, 1942 which stated that all combat qualified officers under the age of 28 would be sent overseas. I was working on important radar projects at that time. I have a copy of a January 11, 1943 memorandum from Edward L. Bowles to the Deputy Chief of Staff through the Commanding General, Services of Supply recommending that three officers not be ordered to overseas duty because of their critical positions. I was one of the three exceptions listed in a memo of January 18, 1943. Professor Bowles, on leave from his position at MIT in charge of communications courses, was the Expert

Consultant to the Secretary of War. On July 26, 1945, another order came out that all combat qualified officers under the age of 35 would be sent overseas. At this time, I was the project officer on guided missiles in the Engineering Branch of Air Force Headquarters. A memo dated August 30, 1945 to the Assistant Chief of Staff, G-1, War Department General Staff recommended that I be retained in my current assignment. So that is why I spent most of the war in the Pentagon. All of my friends were sent overseas.

The End of the War

World War II was over in August 1945. A system was established to return most of the eight million men in the Army back to civilian life. It was a fair system. People received one point for every month on active duty. Next you received a point for every month that you were overseas. Then you received a point for each month in combat. People who had been overseas in combat certainly deserved to get out as soon as they could get transportation home. I had only points for my four years of active duty so that I did not return to civilian life until February 1946. We were offered the opportunity to apply for regular Army commissions or to apply to be reserve officers. I had been commissioned as an Army Signal Corps reserve officer when graduating from MIT's ROTC program in 1938 so I applied to be an Army Air Corps Reserve Officer and was accepted as a Captain.

I would like to comment briefly on an experiment that took place during World War II — the Tuskegee airmen. To put this into context, let us go back in time to 1940. World War II in Europe began in September 1939 with the German invasion of Poland and the subsequent declaration of war on Germany by the British Empire. The United States was determined to stay out of this war in Europe but did take actions to begin to get prepared. Congress passed a law to draft all men between 18 and 36 for a year's military training. Congress passed this law with a margin of only one vote. Congress also decided to start a civilian pilot training program. The United States declared war on Japan and Germany after the Japanese Navy

attacked Pearl Harbor on the island of Oahu, Territory of Hawaii on December 7, 1941.

But first, as the radio announcers used to say before they read a glowing advertising testimonial before the actual program would begin, let me remind you of the sad state of affairs in race relations before World War II. I grew up in tidewater Virginia. Colored people by law were segregated, went to colored schools, were buried in colored cemeteries, drank from colored-only drinking fountains, etc.

I have met one of the famous Tuskegee airmen, Colonel William Campbell, US Air Force (Retired) who lives in Seaside, California. I have read several books about these colored pilots and am reading one right now, an autobiography by LtCol Charles Dryden, a friend of Col Campbell.

Col Dryden's book gives details about his life. His parents were Jamaicans who came to New York City. He was born in Manhattan, went to public schools there, and was bright enough to be admitted to CCNY (City College of New York) which had free tuition. His parents had taught him to speak English — not American — so that he had problems in elementary school when he would say, "It is I," rather than the American "It's me."

He was lucky to be selected for pilot training in Alabama at the Tuskegee Institute, a school founded for freed slaves after the Civil War. It was his first trip south so all the separate "colored-only" drinking fountains, etc., were new to him. Eleanor Roosevelt came to visit Tuskegee and was impressed when one of the colored pilots took her for an airplane ride. Apparently she told Franklin Roosevelt all about this and this eventually helped push the War Department to set up one fighter squadron, the 99th with all colored pilots, and colored maintenance mechanics, colored armorers, cooks, bakers and support personnel.

However, the colored pilots could not "RON" — remain over night — if they went on a cross country mission. They had to fly back home to Tuskegee because they were not allowed to go to eat at an Officers Club at another Army base

or stay in the white only bachelor officers quarters overnight. It is amazing that they were not bitter about this. After all they were officers in the US Army Air Corps just like the white officers, except that they were colored.

Also the War Department would not send them overseas into combat. Someone felt that colored pilots were cowards. Finally, after two years of training they were sent to North Africa. They later moved to Italy where they were based while escorting Air Corps bombers attacking targets in Germany, including Berlin. The proof of the pudding, so to speak, was that no bombers that the Tuskegee airmen were escorting were ever shot down by German fighter aircraft. The Tuskegee P-51 shot down numerous German fighters.

Family history during the war: Russell Jr. was born at Walter Reed Army Hospital on Georgia Avenue on November 5, 1943. When Christopher was born at Walter Reed Hospital on December 27, 1944, we didn't know how we could all fit into our apartment, since Russell, Jr.'s crib was already in our bedroom. By coincidence, the people who had been renting the Ledig house at 603 Park Lane in Bethesda during the war had just decided to move back to Indiana. Ruth asked her Father if we could rent it since it had three small bedrooms. We were delighted to move into it even though we ended up repainting all the rooms.

Nomination for the Army Reserve Officer Training Corps (ROTC) Wall of Fame at MIT

Russell Cleven Coile '38
MIT VI-A. S.B. 1938; S.M. 1939; E.E. 1950
Commissioned: 1 June 1938 — 2nd Lieutenant U.S. Army Signal Corps Reserve
Retired: 11 March 1977 — Colonel U. S. Air Force Reserve

Army ROTC At Mckinley High School, University Of Maryland, And MIT

I was 16 years old when I graduated in June 1933 from McKinley High School, Honolulu, Territory of Hawaii. I had participated in two years of mandatory Army Junior ROTC at McKinley plus a year of optional advanced ROTC. I had been promoted to Cadet Captain.

Because students had to be 17 years old to enroll at MIT, I decided to attend the University of Maryland for a year. Army ROTC was mandatory for two years. However, when I became 17 in 1934 I received a scholarship to come to MIT. I became a student at MIT in September, 1934. There were about 500 in our Class of '38. As a transfer student, I received credit for my first year of Army ROTC at the University of Maryland, and credit for freshman English and freshman Chemistry. In effect, I had to start over as a freshman at MIT. MIT was much more advanced than most colleges. All freshmen at MIT had to study calculus and physics using calculus. At the University of Maryland these courses were considered too difficult for freshmen and were given in the second year.

MIT had two years of compulsory Army ROTC for all physically fit male students. Then students could apply for the optional two years of advanced ROTC. If they were accepted they would be commissioned as 2nd Lieutenants in the Army Officers Reserve Corps at graduation. The Military Science Department had six Army officers. The Department head was a Lieutenant Colonel, Associate Professor of Military Science and Tactics. The Coast Artillery Unit had a Lt. Col. And a Major, Coast Artillery as Associate Professors. The Ordnance Unit had a Major, Ordnance Dept., Associate Professor. The Signal Corps Unit had a Major, Signal Corps, Associate

Professor, and the Engineer Unit had a Captain, Corps of Engineers as Assistant Professor.

I was studying electrical Engineering in Course VI-A so I was automatically enrolled in the Signal Corps Unit. The students studying physics, Course VIII, and mathematics, Course XVIII were also in the Signal Corps Unit. Our Associate Professor of Military Science and Tactics was Major Kirke B. Lawton, Signal Corps.

We were sent to Camp Dix, New Jersey in the summer of 1935 for six weeks of practical training in Signal Corps operations. We lived in tents. Discipline was strict – we were 'put on report' for being absent if we were just a few feet away from being in our assigned place in the formation when the 'fall in' command was given. The punishment was being assigned guard duty during our leisure time when everyone else was swimming, or to spend an hour 'policing the area' (picking up cigarette butts). I qualified as 'marksman' with the Pistol Caliber .45 M1911A1 on the pistol range.

We learned how to lay miles of telephone field wire and operate switchboards. One of the students was hit by lightning during a thunderstorm one afternoon when we were laying wire. He was lucky he wasn't killed. A student from Cornell ended up in the hospital when he accidentally stabbed himself in the leg with one of his pole-climbing leg irons. The training was great fun even if the heat, the dust, the rain and the mud combined to give us a realistic taste of what providing Signal Corps communications under field conditions was all about. I was promoted to Cadet Major in the Signal Corps Unit.

My 1938 MIT yearbook, TECHNIQUE has a photograph of the 28 student members of the ARMY Ordnance Association. Our honorary Signal Corps fraternity Pi Tau Pi Sigma apparently didn't have enough money in our treasury to pay for a photograph of us to be included in the yearbook. Our Theta Chapter at MIT of Pi Tau Pi Sigma was organized in 1933 at Fort Monmouth, New Jersey according to a news article in MIT's The Tech, Volume LIII, No. 42, Tuesday November 7, 1933.

I was in Course VI-A, the cooperative electrical engineering course. In the spring of our sophomore year we could apply to be in a special program for the next three years during which time we would be on a three semester per year basis. We would alternate a semester of study in Cambridge with a semester of work as a student engineer at a company. We would then be scheduled to receive our bachelor's degree and our master's degree

at the end of five years. I had applied to and had been accepted by both the American Telephone and Telegraph Company and the General Electric Company. My four AT&T work semesters were supposed to take place at Western Electric, Kearney, New Jersey, Bell Telephone Laboratories, New York City, New York Telephone Company, New York City, and AT&T Long Lines Department, New York City.

However, both AT&T and GE were having financial problems because of the depression. The national unemployment rate had been higher than 25%. The unions were upset at the thought of student engineers working when they had been or were about to be laid off. Both companies had to temporarily suspend some of our work semesters. In fact, I only had two work semesters instead of the original schedule of four. Furthermore, one was with General Electric at Schenectady, New York and the other at Western Electric.

I was working on my Master's thesis research in October 1938 and taking a graduate course in Acoustics at Harvard. MIT and Harvard had an arrangement that graduate students could take courses at the other school without paying tuition or any other bureaucratic obstacles. I was lucky to take a Harvard course at the Cruft Laboratory given by Professor George Washington Pierce, a famous physicist who had invented magnetostriction while doing sonar research for the U.S. Navy.

Research Assistant, MIT's Electrical Engineering Research Laboratory

In October 1938 I was offered a position as a Research Assistant in the E.E. Research Laboratory. I would be allowed to take one course (my acoustics course) and I could finish writing up my thesis on nights and weekends. The project was to build a Rapid Microfilm Selector for Dr. Vannevar Bush, Vice President of Engineering. Sorting IBM punched cards could be done at the rate of 400 cards per minute. Dr. Bush had designed a Rapid Microfilm Selector which could sort microfilm records using transparent dots — the equivalent of holes in IBM punched cards at the rate of 60,000 per minute. Dr. Bush had used the combination of microfilm instead of paper cards and Professor Harold Edgerton's new stroboscopic flash lamps, and some electronic circuitry for measuring cosmic rays to design this machine. Dr. Bush had received grants of $10,000 from Eastman Kodak and from National Cash Register when he told them that he would have a working model within two years. The $20,000 grant paid for John Howard for mechanical design and overall supervision, Larry Steinhardt for

optical design and me for electronic design since I had taken the place of Claude Shannon who had decided to shift from electrical engineering to mathematics for his Ph.D

Magnetician, Department Of Terrestrial Magnetism And Atmospheric Electricity, Carnegie Institution Of Washington

As it turned out, I was only on the Rapid Selector project the first year, because the Carnegie Institution of Washington had offered me a job when I graduated. The position was with the Department of Terrestrial Magnetism and Atmospheric Electricity. About 1904 Andrew Carnegie had given $40 Million to establish the Carnegie Institution of Washington to study volcanoes and the earth's magnetism. The British Royal Navy had been doing scientific research for many years by taking scientists such as Darwin on voyages, artists to make sketches of natives, and tossing bottles overboard with a note 'Return this note to the Royal Hydrographer, Greenwich, England with the latitude and longitude of the location where you found it and we will pay you two shillings.' This research helped collect data on the direction of currents in the ocean. The Carnegie Institution of Washington built a non-magnetic sailing ship of wood with bronze bolts for making measurements of the declination of the compass (the direction of the magnetic north pole from the geographic north pole). This ship — the Carnegie - made seven trips around the world each taking about three years. It was destroyed by a fire in Samoa while refueling.

I was in the middle of a six month training program in Washington, scheduled to go to Peru in April 1940 when World War II began in September 1939. I was sent immediately on a Grace Line freighter to Callao, Peru to go to the Huancayo Magnetic Observatory because the observer-in-charge was a Canadian who had been called to active duty by the Royal Canadian Navy.

I had an interesting job for two and a half years at the observatory. The observatory was in the Andes at a height of 11,000 feet. It was at latitude 8 degrees south but on the geomagnetic equator since the magnetic North Pole is about 1000 miles from the geographic North Pole. It was about 10 miles from the town of Huancayo which was the end of a railway line from Lima about 200 miles away. The train went over the backbone of the Andes through a pass at 15,900 feet which was the lowest part of the Andes in that region. This pass was within 100 miles of the Pacific Ocean. The

observatory had been built about 1921 by two carpenters sent down from Washington.

This was a geophysical observatory, not an astromical one with telescopes. We carried out research on the earth's magnetism, electrical currents flowing in the earth's crust, earthquakes, atmospheric electricity and lightning, We had a special cosmic ray measuring apparatus designed by Professor Arthur Compton, University of Chicago, brother of Karl Compton, MIT president. We measured the height of various layers of the ionosphere to assist in research on short wave radio propagation. The one thing we did which was not geophysical was to participate in a world-wide program to observe the sun for sunspots. Our observatory was assigned a 30 minute period each day and one of us had to observe the sun through an instrument called a spectrohelioscope.

We had a seismograph given to the observatory by Cal Tech in Pasadena. We sent any earthquake data by amateur radio to a radio operator in Philadelphia who would fax our info to Washington, D.C. There were three of us observers at the observatory plus about ten indians. We had two Indians who had been to a school run by missionaries who spoke some English. They worked in the office processing data. Then we had two teenage kitchen helpers, a truck driver/mechanic, a gardener and two night watchmen.

We were miles from the nearest village so that the delicate instruments would not be affected by anything. During the rainy season we collected rainwater from the roof of the main house. We had a hydraulic ram which automatically pumped water from the Mantaro river, a half mile away. We had a diesel engine running a generator which provided us with electricity for house lights and our instruments. For backup, we had two gasoline engines with generators in case anything happened to the big diesel. For backup to the backup we had a number of large glass telephone exchange type batteries for providing electricity for the instruments. The refrigerator had been modified to run on kerosene and the kitchen stoves ran on kerosene.

Each of us observers took turns going down to Lima every six months for a week. This was designed to get us out of the 11,000 foot altitude. Just by chance, I was in Lima on May 24, 1940 when Peru had a damaging 8.4 Richter magnitude earthquake. About 200 people were killed as adobe houses disintegrated and the clay roof tiles fell on the people inside. I was

actually on an electric streetcar going the five miles or so to Callao, the port on the ocean. The streetcar jumped off the tracks but did not fall over. The overhead wire broke and was sparking on the street. Adobe houses on both sides of the street were disintegrating with big clouds of dust. I hurried toward Callao about a mile onward as I had been invited to have lunch there with a friend. I didn't understand why everybody else was hurrying the opposite direction towards Lima. My friends lived in a concrete house and were OK. They gave me a history lesson which explained why people were fleeing away from Callao. Apparently, in 1736 there was a large earthquake and a tsunami which came ashore at Callao. One historical account reported that 8,000 people drowned, another said 20,000 drowned. A church was built about two miles inland from Callao at the high water mark as a memorial to those who were killed.

When we heard the news that the Japanese had attacked Pearl Harbor, I sent a cable to the Carnegie Institution in Washington. I resigned because I had a commission as a 2nd lieutenant in the Army Signal Corps Reserve. In retrospect, that was a stupid thing to do. If I had waited until I was called to active duty, I could have taken advantage of a law passed by Congress that required your employer to guarantee you a job when the war was over. So I had burned my bridges. I told them that I would return to New York on the last Grace line freighter which was enroute from Chile to New York.

World War II Active Duty In The Army

Major Lawton, our MIT ROTC Signal Corps Unit Associate Professor of Military Science and Tactics was now in Washington in the Office of the Chief Signal Officer at the War Department. I had cabled him from Peru that I was coming back to the States to report in for active duty. I took the Japanese attack on Pearl Harbor very personally. My father was a Coast Artillery soldier, stationed at Fort Kamehameha at the mouth of Pearl Harbor. We had lived there from 1929 to 1933 while I was going to Mckinley High School in Honolulu. I took the train from New York City to Washington and reported in to Major Lawton. He had already prepared a draft of orders putting me on active duty. I took a bus to Raleigh Haberdashers at 14th and G Streets NW, bought an officer's uniform, some shirts, shoes, etc. The resident tailor hemmed the pants while I waited. The next morning, I went back to OCSigO Personnel office in uniform and picked up my orders which Major Lawton had the right folks sign. They sent a group of about 20 of us by bus to Walter Reid Army Hospital for a physical exam. After we took

all of our clothes of, several doctors walked down the line measuring our temperature and blood pressure. We had to provide all sorts of details of our childhood diseases such as chicken pox measles, mumps, etc. After a dentist examined our teeth, we were all accepted. It didn't take long. We were then bussed back to the War Department building on Constitution Avenue at 19th Street.

Major Lawton asked me to go to T-26, a temporary office building on Constitution Avenue near an old brewery (where the Kennedy Center is now) and pay my respects to Lieutenant Colonel Tom Rives, head of the Research & Development Division My orders had assigned me to the Signal Corps Laboratories at Fort Monmouth, New Jersey, since Major Lawton had discussed my background in Army ROTC at MIT and my civilian experience at the Huancayo Magnetic Observatory measuring the height of ionosphere layers. The ionosphere research was in some respects similar to the secret radar (radio direction finding and ranging) research at Fort Monmouth. Lt.Col. Rives asked if I would be willing to have my orders changed to assign me to duty in his Radar Branch in Washington rather than going to Fort Monmouth. He explained that in pre-World War II days, it was War Department policy not to order 2nd lieutenants to duty in Washington without their permission as it was deemed too expensive for them to live there on their pay scale. Apparently the US Navy had the same sort of policy in that Annapolis Naval Academy graduates were ordered to some battleship or cruiser and forbidden to marry for three years after graduation so that they could pay off their debts of buying summer, winter, and dress uniforms. I told Col Rives that it would be fine with me since my father and mother now lived in Hampton, Virginia about 200 miles away. I had not seen them for the two years that I had worked in Peru.

Col. Rives said that the most important program in the Radar Branch was a secret project called 'Identification, Friend or Foe' (IFF). He had decided to put me in charge of the IFF unit. The other vacancy was in radar countermeasures. Countermeasures wasn't considered important in those early days. This was rather shortsighted since it turned out that countermeasures became tremendously important two or three years later when the Army Air Force began flying B-17 and B-24 bombers over Germany. The Germans had radar-controlled anti-aircraft guns. Harvard's countermeasures laboratory and Signal Corps production of radar jammers became essential.

The Communications Branch was across the hall. 2nd Lieutenant Bill Hewlett (MIT S.M. 1936) was the project officer on the SCR-522, a VHF voice communication set for aircraft. The War Department was expanding from 350,000 men to eight million and someone decided that more officers were needed, An order was issued that officers must have six weeks in grade before being promoted. Bill must have come on active duty about the same week that I did, because we were both promoted to 1st Lieutenant after six week on active duty. Then someone else decided that that was insane and a new order came out that officers had to be six months in grade before being promoted. Sure enough, we were both promoted to Captain, Signal Corps Reserve after precisely six months. However, I remained a Captain for the next three years. Bill was transferred to a special job in the New Developments Division of the War Department's General Staff where he stayed until the end of the war in 1945. But I digress. Back to my activities.

I was assigned be a courier one day. The Chief Signal Officer had asked the British if Robert Watson Watt (later Sir Robert Watson Watt) who had invented radar for the British would make a survey of all installations in the field of the SCR-270 radar. The one on the island of Oahu in the Territory of Hawaii had detected the Japanese formation of more than 100 carrier based bombers at a range of about 130 miles as they were approaching to bomb Pearl Harbor. None of the other SCR-270s seemed to be working. Watson Watt was flown to the Panama Canal Zone and then to other locations on East, Gulf and West Coasts to inspect the siting of the SCR-270. His SECRET (big deal in those days) report was very critical. He found that almost all were put in the wrong place for a radar. They had been installed in some convenient spot with no thought as to the harmful effects on detection of radar ground clutter. I was ordered to take the secret report to the Signal Corps Radar Lab at Fort Monmouth, New Jersey. I went to the Armory and got a pistol caliber .45 and a special brief case which was chained to my wrist to carry the secret report. On the train to New York, it was just my luck to be approached by a young Russian officer in uniform. It turned out that he wanted to practice speaking English with me (the Russians were our allies, sort of). Initially I was petrified until I realized he just wanted to practice talking. After we completed our friendly practice he showed me his officer's swagger stick. It actually was the scabbard for a cleverly concealed dagger just an inch shorter than the stick.

I began working twelve-hour days, seven days a week as the IFF project officer. Everything about IFF was secret. Actually, both the Americans and the British had developed secret IFF systems without telling the other. The Signal Corps had General Electric design and build a secret identification set called SCR-515. (Set, Complete Radio, number 515). The system had been tested but not put into production, The British had designed an identification set which they called IFF Mark II. The British persuaded the IFF Committee of the Combined Communication Board to have the American manufacture this British design for all Royal Air Force, American Army and Navy Aircraft. The Signal Corps selected Philco in Philadelphia, a pre-war manufacturer of home radios to produce the IFF Mark II. The American copy was called SCR-595.

The British had already designed and built models of an improved IFF Mark III. They persuaded the Americans to build this airborne transponder called SCR-695. An interrogator's antenna was mounted on the ground or ship radar's antenna. When a strange new blip appeared on the plan position display of the ground or ship radar, the operator would send a challenging signal. The receiver in the airborne transponder in a friendly airplane would automatically trigger a transmitter to send a 'friend' response which would appear as a display of little dots behind the blip on the screen. The radar operator would then know that the strange blip was a friend not a foe. The British terminology of friend or foe, interrogator and transponder was adopted.

Things were really hectic in 1942. One of my projects was a new interrogator antenna to be mounted on the antenna of the SCR-270 radar (the radar which detected the incoming Japanese formation approaching Pearl Harbor). The first model was ready for testing. I asked the Aircraft Radio Lab at Wright-Patterson if they would assign an aircraft in which the Naval Research Lab could install an airborne transponder to run acceptance trials. They replied that they were busy, had no spare airplanes, but could do the testing in about four months, maybe. My boss went ballistic and told me to get it tested next week somehow. After the war started, the Army Air Corps had commandeered all civilian general aviation airplanes. Bolling Field in Washington had more than 100 airplanes just parked there waiting for someone to figure out what to do with them. The owners had flown them othere to turn them over to the Air Corps. Maintenance people turned on the engines once a week just to keep them in operational condition. I went

over to Bolling Field and spoke to the right people. I explained that I was the project officer on a new secret IFF antenna. We needed an airplane for a couple of days to fly up to Fort Monmouth, New Jersey. The actual flight test would be from Sandy Hook, New Jersey out over the ocean to a distance of 100 miles to determine whether or not the new antenna worked. An officer was assigned to help me. He showed me a Grumman amphibian called a Widgeon. It was a seaplane with a float hanging down from the wingtip on each side. He told me that they had three of these seaplanes. I asked about a pilot who could fly our test mission. He asked around and found an Air Corps pilot friend in headquarters who thought he could get a couple of days off to fly for us. The only problem was that his friend had never flown a seaplane. The solution to that was to get one of the senior pilots at Bolling to check him out. The first check ride was a disaster. They were planning to do three water landings, but the third one had a cross wind and the wing was not level when they tried to land. A float about five feet inboard of the wingtip hit the water and broke off. No problem, they started over in a second Widgeon. They had a good water landing so they moved on to practice landing on the runway with the amphibian's wheels. This time, again they had a cross wind. The plane drifted over to the side of the runway and a wing float hit a runway light and broke off. No problem, they started over in the third Widgeon.

Well, when the pilot was finally checked out, he had to fly from Bolling Airfield to Anacostia Naval Air Station. It seems strange now, but the Navy field and the Army field actually were next to each other, but there was no common runway, and no way a plane could taxi from one field to the other. When the plane arrived at Anacostia, the Naval Research Lab installed the airborne transponder. The NRL electronics technician and I flew in the passenger compartment of the hull and we took off. We got to Fort Monmouth and actually to Sandy Hook. At that point, the pilot told me that the weather was turning bad and that he refused to fly 100 miles off-shore in bad weather. I persuaded him to go just five miles off-shore since he could still see land and we tried to see if the experimental model IFF antenna installation worked. It didn't work! So, the test was successful in demonstrating that the antenna didn't work and we did not need to go 100 miles off-shore after all. I wrote all this up in a report and recommended that the antenna contract be cancelled.

The whole idea of an identification friend or foe system was secret. It was decided that no workable airborne transponder should fall into German hands if a RAF or American plane were to be shot down. As it turned out, hundreds of RAF and American aircraft such as B-17, B-24 and P-51 were shot down. The Signal Corps asked Picatinney Arsenal, in New Jersey to design and build little explosive devices which were mounted inside the case of each SCR-695. If the B-17 was shot down, the pilot, if he were still alive, could push a special red emergency switch on the instrument panel to blow up the IFF set. This assumed he had time to do this before he jumped out of the plane with his parachute. If the pilot and copilot were killed in flight, there was a backup system of an accelerometer inside the transponder which would activate a switch to blow up the set when the plane crashed on the ground. I was invited to observe the test of this explosive at the Naval Research Lab. We were on the roof of one of the lab buildings because the explosive was not supposed to go through the case. As it turned out, the Picatinny Arsenal engineers were very embarrassed when the explosive detonated and the whole box was flung off the roof to land in the street three floors down. The charge was about three times too big.

The British were very anxious to receive the Royal Air Force's share of the SCR-695 airborne transponders which were being manufactured by Motorola in Chicago. As the Army's IFF project officer, I had to give a progress report each week to my boss who forwarded it on to a Major General in the War Department's Supply Service who passed it on to the White House so that Roosevelt could tell Churchill what the status of production was. Our goal was to send several hundred to England by the end of December, 1942. I was sent to Chicago in December to go to Motorola's factory to get the latest information. Fortunately, the factory was making the desired goal. However, there were complications ahead. The urgency and pressure on the production workers had apparently not been communicated to the people who were in charge of shipping these important sets to England. They treated this shipment as a routine matter and did not even pick up the equipment from the loading dock for three days. The workers understandably got upset at this. Someone finally found out about this and the shipping people rushed over. The next mistake was that they put all the sets together and put them on a single ship instead of sending half of the sets on one ship and the other half on a different ship.

A German submarine sank the ship with all the sets and of course it took some time to sort out that that was the reason the sets did not arrive in England.

An interesting thing happened to me on that trip. Professor Arthur Compton, University of Chicago (Nobel Prize in Physics in 1927 and brother of Karl Compton, President of MIT) had visited the Huancayo Magnetic Observatory in July 1940 in connection with his cosmic ray research to see if his apparatus was working properly. Mrs. Compton had invited me to call her if I ever got to Chicago. After visiting the Motorola factory to check on the IFF production, I had telephoned her to say hello. She told me that it was Arthur's birthday and invited me to his birthday dinner that very night. When I arrived she asked me to sit next to an Italian lady, Mrs. Enrico Fermi who didn't speak much English. She thought I might be able to converse with her in Spanish. Everyone was in high spirits at the dinner. It was years later that I found out that that they were actually celebrating the successful beginning of the atomic age on December 2, 1942. Dr. Enrico Fermi (Nobel Prize in Physics in 1938) had assembled thousands of graphite blocks and uranium pellets into a reactor called Chicago Pile Number One. The world's first self-sustaining nuclear chain reaction took place on a squash court at Stagg Field at the University of Chicago.

Speaking of Nobel Prize winners, I was the Signal Corps project officer on identification equipment so that I used to go to Cambridge to the Radiation Laboratory at MIT in connection with their research for the Signal Corps on IFF and beacons. The head of this section was Luis Alvarez who won the Nobel Prize in Physics in 1968. Dr. Alvarez was at the Radiation Lab from 1940 to 1943. He went to England in 1943 with the first Ground Controlled Approach blind landing system. The RAF project officer was a Flight Lieutenant Arthur C. Clarke, who later became famous for proposing satellites for communications. Dr. Alvarez returned to the States after the GCA system was installed, and was sent to the Manhattan Project at Los Alamos where he designed the detonators for the plutonium bomb. Actually, he flew in a special instrumentation B-29 on both the Hiroshima and Nagasaki missions in order to measure the size of the explosions.

The British Telecommunications Research Establishment, Great Malvern had already begun research on the next generation of IFF called the IFF Mark V. A special British/American group called 'Combined Research Group' was established at the Naval Research Lab headed by Dr. Cleeton,

NRL and Rennie Whitehead, TRE. I was one of only five Americans who were given special security clearances to visit the group and observe their progress. Actually, the war was over before the development was finished. However this was an important step in the post-war development of the IFF Mark X (really 'X' and not ten) which became the Air Traffic Control Beacon System.

One more word on IFF. All of these systems actually identified friends. This meant that the pilot had to turn his IFF set on and the IFF airborne transponder had to work. On the other hand, the MIT Radiation Laboratory just before the end of the war had actually designed a set which identified enemy aircraft. This equipment called Black Sambo analyzed the modulation of radar pulses returned from Japanese propeller driven aircraft to an American night-fighter's airborne radar. It could determine that these Japanese pulses were different from the pulses returned from American aircraft. The war ended and so did the development.

The Signal Corps was finding it difficult to design and manufacture all the different communications and radar equipment needed by Army's infantry and artillery units plus all the equipment for new types of fighter and bomber aircraft of the Army Air Corps. One of the problems was nomenclature. The prewar system of just assigning a number to a new equipment did not provide any information as to what type of radio or radar it was, or its use, or was it hand held, carried in a truck, tank or aircraft, etc. The Army Air Corps had assigned a liaison officer to the Signal Corps' Research and Development Division to keep the Air Corps informed of development of interest to them. He found it difficult to keep up to date on more than 700 different types of equipment. I only had a few IFF sets, so that I knew what my SCR-515 was and the SCR-695 was. He designed a completely new system to cover Naval equipment as well as Army equipment. In his new Army/Navy system everything looked like this: A/N APR-1. This first letter A was for airborne equipment, G would be ground, S would be ship, etc. The second letter P stood for radar, and C would be communications. The third letter R stood for receiver, and T would be transmitter. The number 1 indicated that this equipment was the first of this type. Fortunately, everyone recognized the advantages of a sensible system like this and it was quickly adopted.

When this new nomenclature was being adopted in early 1942, our Signal Corps offices were located in temporary buildings at Fort McNair.

We were transferred to the new Pentagon in May, 1942. The first leg of the Pentagon contained the bus arrival lanes in the basement, a concourse on the first floor and cafeterias on the second floor. When the second leg of the Pentagon was finished in April, 1942, Army Ordnance moved in, with the Office of the Chief Signal Officer arriving in May. The Pentagon was and is such an unusual structure that a few words about it may be of interest. In the summer of 1941 approximately 24,000 War Department personnel were working in more than 20 unconnected buildings. The Army suggested building a single new structure to shelter as many as 40,000 federal workers. Roosevelt agreed and Brig. General Somervell, Chief of Construction, Quartermaster General contacted the chair of the appropriate House committee to pave the way for this reorganization.

On July 17, a Thursday, Somervell addressed the House Subcommittee on Appropriations and was told by its chairman, Virginia Rep. Clifton A. Woodrum to develop a proposal. On Tuesday, July 22, Somervell presented the the proposal to Woodrum's committee. The concept was approved by the House on July 28 and the Senate on August 14. Roosevelt signed the bill on August 25. The preliminary plans were created in 34 days. To accomplish this, the chief architect's office grew to 327 architects and engineers supported by 117 field inspectors. Detail prints came out of at the rate of 12,000 to 30,000 a week.

From approval by Congress until the ground breaking took only 29 days. And then 15,000 construction workers worked three shifts, seven days a week with floodlights for night work. The construction of the largest low-rise office building in the world took just 16 months under wartime conditions of labor and material shortages. There was no steel for elevators so ramps and stairs were installed between the five floors.

I worked for 17 years in the Pentagon — three years on Army activity duty from 1942 to 1946 and 14 years more or less as a civilian working for the Navy Department on Office of Naval Research grants to the Mathematics Department at MIT.

Another important project of mine in 1944 was with the General Instrument Company in New Jersey. They were building a radio transmitter which could be mounted in a bomber aircraft to send up/down, right/left control signals to a receiver in another aircraft flying in formation with it. The US Navy had a squadron in England of B-24 type aircraft which the Navy called PB4Y-2. Someone came up with the idea of guiding a

radio-controlled aircraft loaded with explosives across the North Sea from England to Germany. The control aircraft was to steer the drone into a dive on a V-2 launching site. These drone aircraft were called 'Weary Willies' because they were deemed to be too dangerous for any further operational missions because of damage from German anti-aircraft artillery or just plain old age. However, the scheme was to repair them for one final kamikazi dive into a difficult target – a V-2 launching site. Joseph P. Kennedy, Jr. was a navy pilot who had volunteered for one of these missions. Joe was the drone's pilot and the co-pilot was an expert on radio control projects. On August 12, 1944 the drone and its 'mother' control plane took off. Joe's drone was loaded with 21,000 pounds of a new experimental explosive. The procedure was for the two planes to fly in formation until the mother plane had achieved complete control over the drone at the desired cruising altitude and heading towards the target. Then, Joe and co-pilot would jump out of the drone PB4Y-2 and parachute down to safety while the mother plane controlled the drone all the way and dived it into the target. Unfortunately, there was an explosion onboard the drone before they were ready to jump out and both Joe and co-pilot were killed. Joseph Kennedy was posthumously awarded the Navy Cross. In 1946 a destroyer, the USS Joseph P. Kennedy, Jr. DD-850 was launched in his memory. (Note: The German V-2 attacks on England began in September. 518 V-2s hit London between September 8, 1944 and March 27, 1945. There were 21,380 civilian casualties of killed and wounded and 20,000 houses destroyed.)

On April 19, 1944 I qualified on the rifle range as sharpshooter on the U.S. Carbine, caliber .30 M-1. On August 25, 1944, my Army Air Corps friends arranged for me to attend a five day 'Staff Officers Course in Airborne Radar' at Langley Field, Virginia. Unfortunately, after two days my Signal Corps boss had me recalled to the Pentagon to prepare a report that he was incompetent to do. It was a nothing-type project and I was disappointed that I missed out on the actual flying days of the course.

Later in 1944, I was the Signal Corps project officer on another important piece of equipment - a training device for bombardiers. The Radiation Laboratory at MIT had developed a radar bombsight for B-17 and B-29 aircraft called the A/N APQ-13. Bell and Howell in Chicago had been given a contract by the Signal Corps to develop and manufacture a trainer for bombardiers who were now going to have the A/N APQ-13 bombsight in addition to their Norden optical bombsight. This trainer was a

tank approximately 4 feet by six feet filled six inches deep with water. The bottom of the tank was a piece of glass. An enemy target area would be built up by putting sand to simulate land, small metal blocks to simulate buildings, and the glass would simulate rivers, lakes or ocean water. Small metal strips across the glass rivers would simulate bridges A small sonar transducer mounted on a movable carriage was suspended two inches in the water. The radar bombardier's display was thus provided with a reasonable authentic looking depiction of what the actual radar would see if the aircraft were approaching Japan from the ocean and looking for the intersection of ocean and land. If a river ran through a city, the sonar transducer would show the river and also the pretend bridges across the river. The radar bombsight was an essential backup to the optical Norden in case clouds made it impossible for the bombardier to see anything through the Norden. My counterpart project officer in the Army Air Corps innocently asked his boss why this project was so important. His colonel told him that there was a super secret program with the codename SILVERPLATE associated with the Manhattan Project. He further said, 'That's all you need to know.' 'If I hear you trying to get any further info, you'll be court-martialed.' Months later we found out that that SILVERPLATE was Colonel Paul Tibbett's 509 Composite Group which dropped the first atomic bomb on Hiroshima, and that the Manhattan Project was the Los Alamos bomb making laboratory.

In early 1945, the Army Air Corps went to War Department Secretary Stimson and told him that the performance of the Army Signal Corps was completely unsatisfactory in the design and manufacture of airborne communications and radar equipment. They requested that the Air Corps be given complete responsibility for all aspects of their own radio and radar equipment. They requested that the Signal Corps transfer to the Air Corps those officers who had been working on Air Corps programs. They also requested that the Aircraft Radio Laboratory at Wright-Patterson Airfield, Dayton, Ohio be transferred to the Army Air Corps. Secretary Stimson found these allegations to be true and issued orders to correct the situation. Thus I was transferred from the Office of the Chief Signal Officer to Headquarters, Army Air Forces on April 1, 1945. Some of the officers who were transferred were somewhat upset by this. 'We will be second-class citizens,' they complained. 'All Air Corps officers are trained pilots and wear wings to prove it' was a common theme. The Air Corps in retrospect

did its best to convince us that we were not second-class citizens. A few (very few) were sent to the Tactical Air Force school in Orlando, Florida to take the Radar Bombardier course and receive radar observer wings. Years later, one (and only one) of our group of former Signal Corps officers (Pete Sandretto) was promoted to Brigadier General. He had been in charge of radio communications for United Airlines before the war. Some of us with advanced engineering degrees were put in research and development jobs since the great majority of Air Corps officers had only two years of college before becoming aviation cadets and taking flight training. I was eventually promoted to the rank of Colonel. Now you can appreciate why I believe in miracles.

After three months in Air Force headquarters, I was assigned to be the project officer on several guided missile projects. My Colonel suddenly received orders to go to California and inspect Howard Hughes' *Spruce Goose*. Hughes had received government financing of $18 million to build this wooden flying boat. President Roosevelt personally had ordered the Household Finance Agency to provide Hughes with the money. Now Hughes had asked the government for additional money to finish construction. The Army Air Corps was asked to send an expert out to see what was going on. My Colonel had been the test pilot on the B-19, the largest experimental bomber the Air Corps had ever built. It had been decided not to build the B-19 but build the smaller B-29 instead. The Colonel was going to fly his own twin engine plane to California. Since it could carry four passengers, he invited me and another Captain to come along, plus his secretary who was in the Women's Army Corps. We departed from Bolling Field in Washington on July 2, 1945. We stopped overnight in Wichita, Kansas. The next day we went to Wendover Field in the northwest corner of Utah. I was the project officer on AZON (azimuth only) radio controlled bombs. A 2,000 lb bomb had a special tail assembly with a smoke generating flare, a radio control receiver and moveable tail fins. On July 4, we observed some trials of AZON bombs. When the test plane, a B-17 dropped one AZON bomb at its 20,000 foot altitude above ground our observer group could see the smoke flare almost immediately. The B-17 bombardier could give right or left signals to the bomb with his radio control transmitter. The bomb could be controlled in azimuth only so that it could hit near a railroad line for example, if the airplane was flying parallel to the tracks. A potential miss of

several hundred feet could be corrected so that the bomb (filled with sand) would impact within 50 feet ot the target in the trials we observed.

Incidentally, Wendover Field had just a few planes and research people there when we arrived on July 3. We found out later that Col Tibbett's and his 509th Composite Group of 15 B-29s had arrived at Wendover on June 14 and had all packed up and left on June 27 to go to Tinian Island. After they arrived at Tinian on July 2nd, they flew practice bombing and night orientation missions until July 22, and combat bombing missions on July 24 and 26. After flying one atomic bomb practice mission on July 31st, they waited for President Truman to give them the order to bomb Japan. On August 6 the Enola Gay dropped a 'Little Boy' atomic bomb on Hiroshima. The Little Boy was 12 feet long and 28 inches in diameter and consisted of a gun which fired a slug of uranium 235 down its barrel into another piece of uranium.

The USS Indianapolis cruiser (CA-35) dropped anchor off Tinian Island on July 26 to deliver the Little Boy. Five days later on July 29, Japanese submarine I-58 torpedoed the ship which was sailing in radio silence towards the Philippines. The ship capsized and sank within 12 minutes so that no radio signal about the disaster was sent. Because of communication errors no search action was initiated for some days. There were only 317 survivors after five days in the water out of a crew of 1199. The captain was court-martialed and found at fault for the sinking. He later committed suicide. In October 2000, Congress passed a resolution to clear him of any guilt. His son had tried for 35 years to have the Navy reexamine the situation with the help of the Japanese Navy.

It is of interest that the Little Boy atomic bomb was assembled in flight after takeoff. Many ordinary B-29s had crashed on takeoff even with the 8,500 foot long runway because they were so overloaded with fuel and bombs. No one wanted the Enola Gay to crash on take off with a live atomic bomb and blow up the whole airbase. Navy Captain William 'Deke' Parsons, the naval gun expert at Las Alamos was a key person in the design of the Little Boy. He was the weaponeer who assembled the bomb in flight. I was glad that I had the chance to meet Admiral Parsons some years later at a party in Georgetown. My hostess was the grand-daughter of Professor Albert Abraham Michelson, University of Chicago. Albert Michelson entered the United States Naval Academy in 1869 at age 17 and graduated in 1873. After two years of sea duty he returned to Annapolis to teach physics.

In 1878 he began experiments to measure the speed of light. In 1907 he was awarded the Nobel Prize in Physics – the first American to receive a Nobel Prize in the sciences. Also, he was the first and only U.S. Naval officer to ever receive a Nobel Prize in Physics. Former President Jimmy Carter, an Annapolis graduate and former submarine officer, years later received the Nobel Peace Prize. The relevance of all this was that I had hired two of Professor Michelsons great-grandchildren when I was in charge of small research units assigned to the Navy supported by Office of Naval Research grants to the Math Department at MIT. I had hoped that there should be something in their genes – and there was. They were both remarkably bright. They had grown up living in quarters at the Dahlgren Proving Ground where their Naval officer father had been stationed when Lt. CDR Parsons and his family also lived there.

Apparently the radar bombsight was only used for backup on both atomic bomb missions. Three B-29s took off one hour before the Enola Gay and similarly before the Bockscar to fly to the target area and observed the weather. They reported back to the Enola Gay that there was three-tenths cloud cover over the target. This was good for the Norden optical bombsight so that the bombardier knew he was bombing the correct target. But I was glad that our radar bombardier training device had been delivered on time to the 509th Composite Group.

One other personal connection. Dr. Luis Alvarez had been in charge of my identification and beacon research at the Radiation Lab. He had designed the detonators for the Fat Man plutonium bomb when he was transferred to the Los Alamos Lab of the Manhattan Project. He had also designed instrumentation to measure the yield of the atomic bomb explosions. He flew in a special B-29 just behind both the Enola Gay and Bockscar to measure the yield of the blasts.

We left Wendover the next day and flew to Seattle. My Colonel arranged for the three of us to go for an orientation ride in a B-29 while he had some business with Boeing. Each B-29 had a flight test after it came off the production line in order to be accepted by the Air Corps. I had flown in an experimental B-17E from Wright-Patterson to Toronto, Canada once but the B-29 was a much larger aircraft.

Our next stop was in Los Angeles for the visit to inspect the *Spruce Goose* – the purpose of the whole trip. Actually the flying boat was constructed of laminated birch – not spruce. Some wag had christened it the Spruce

Goose. The aircraft's size was unbelievable. The wingspan was 320 feet, chord 51 feet, depth of wing 11 feet with wing area 11,430 square feet. There were eight 3,000 horsepower engines with 17 foot propellers. Inside the hull one could visualize space big enough for 750 soldiers.

I was very disappointed when we visited Howard Hughes' offices. I had expected to find a bunch of Hollywood's most beautiful secretaries. You can imagine my shock when we arrived and found that the secretarial staff was completely male. I should have known better. When I went to work in 1939 at the Department of Terrestrial Magnetism and Atmospheric Electricity on Broad Branch Road in Washington, DC, there was a woman librarian but all secretaries, typists, and filing clerks were men.

Howard Hughes never did get any more government funding. He personally kept his cabinet makers busy trying to complete the flying boat. Actually, two years after the end of the war, he took off and flew a mile at a height about 70 feet on November 2, 1947. He did this with minimum publicity. No one had expected a flight – it was supposed to be taxiing trials. No one knows why the flight was only a mile and in a straight line with no turns. Someone speculated that Howard felt that the controls might not be working as designed and didn't want to try to turn and end up crashing the flying boat.

One of the most interesting events of our whole trip was a visit to Paramount Studios. The Colonel's Women Army Corps secretary arranged through her mother for us to spend the day at the studios. Her mother worked for Edith Head, the costume designer for Paramount. We were taken all over, ate lunch there, and watched a movie being filmed. Alan Ladd was the star. We watched about a dozen takes of the same two minute scene before the director was satisfied. We were introduced to important people such as Edith Head but not to the actors like Alan Ladd or Ray Milland so that we would not distract them. They seemed to have a difficult time just remembering a minute or so of their lines plus the timing of their movements. No wonder it took so long to film a movie.

We flew from California to Eglin Field, Florida where the Colonel dropped me off and proceeded back to Washington. I stayed at Eglin for three days to observe tests of one of my guided missile projects – the JB-2, the American copy of the German V1 pulse jet guided missile. The history of the V1 buzz bomb is interesting. Werner von Braun started research in 1937 at Peenemünde in the Baltic. The first Vergeltungswaffe 'vengeance

weapon' was a pilot-less aircraft 25 feet long with 17 foot wing span with a 600 pound thrust pulse jet engine. It had a range of about 160 miles at an altitude of 2,000 to 3,000 feet at a speed of about 360 knots with a flight time of about 22 minutes. The warhead in the nose was about 2,000 pounds. The Germans built 55 launching sites with steam catapults and 157 foot long launching rails. More than 30,000 V1s were manufactured in a munitions factory inside the Harz Mountains using slave labor from nearby Buchenwald concentration camp. The D-Day invasion of northern France was on June 6, 1944. Between June 13, 1944 and March 29, 1945, a total of 9,251 V1s were launched against London. Hitler ordered them all aimed at Tower Bridge as the target. 2,419 made it to London. 2,000 were shot down or overturned by RAF Spitfires placing a wing under the V1 wing and upsetting the missile. A Squadron Leader 'Ace' was credited with 59 kills. 1,971 were shot down by 1,800 antiaircraft guns before the buzz bombs reached London. 278 were snagged by cables of 1,000 barrage balloons.

The British gave the Americans several buzz bombs which had crashed without detonation of the warheads. Wright-Paterson prepared reverse engineered drawings and a contract was given to Republic Aviation to build 10,000 airframes. Ford built the engines. Production of the JB-2 'Loon' began in January 1945. It was planned to launch them against Japan from LSTs (Landing Ship Tanks). The tests were proceeding okay. I had a bit of luck in getting back to Washington. An experimental B-25J with a 75 mm forward firing gun was going to Wright-Pat at Dayton and the pilot let me ride in the bombardiers position. Then I was able to fly from Dayton to Bolling Field on the daily shuttle.

The Adjutant General of the War Department issued an order on August 5, 1942 and a supplementary memorandum of December 5, 1942 that all combat qualified officers under the age of 28 would be sent overseas. I was working on important radar projects at that time. I have a copy of a January 11, 1943 memorandum from Edward L. Bowles to the Deputy Chief of Staff through the Commanding General, Services of Supply recommending that three officers not be ordered to overseas duty because of their critical positions. I was one of the three exceptions listed in a memo of January 18, 1943. Professor Bowles, on leave from his job at MIT in charge of communications was the Expert Consultant to the Secretary of War. On July 26, 1945, another order came out that all combat qualified officers under

the age of 35 would be sent overseas. At this time, I was the project officer on guided missiles in the Engineering Branch of Air Force Headquarters. A memo dated August 30, 1945 to the Assistant Chief of Staff, G-1, War Department General Staff recommended that I be retained in my current assignment. So that is why I spent most of the war in the Pentagon. All of my friends were sent overseas.

World War II was over in August 1945. A system was established to return most of the eight million men in the Army back to civilian life. It was a fair system. People received one point for every month on active duty. Next you received a point for every month that you were overseas. Then you received points for months in combat. People who had been overseas in combat certainly deserved to get out as soon as they could get transportation home. I had only points for my four years of active duty so that I did not return to being a civilian until February 1946. We all were offered the opportunity to apply for regular army commissions or to apply to be reserve officers. I had been commissioned as an Army Signal Corps reserve officer when graduating from MIT's ROTC program in 1938 so I applied to be an Army Air Corps Reserve Officer and was accepted as a Captain.

Broadcast Station Design Engineer, Colton & Foss, Washington, D.C.

Just before I became a civilian, Major General Roger B. Colton who had been in charge of Signal Corps research and development all through World War II called me into his office and asked me if I had a job lined up. When I said no, he invited me to work for him. He told me that he was going to go into partnership with Bill Foss, a consulting engineer who designed radio broadcasting stations. He told me he was asking another Signal Corps captain, Jack Moffett to come also. He said he would pay us the same salary that we were getting as captains. I had a very interesting year at the new Colton & Foss, Inc. offices at 15th and K Streets NW learning to be a consulting engineer designing AM and FM broadcast stations. I participated in the design of broadcast stations and preparation of engineering reports for applications to the Federal Communications Commission for the following: AM at Great Falls, Montana; AM at Renton, Washington; AM and FM at Fort Worth, Texas; and AM and FM at Seattle, Washington. I appeared as an 'Expert Witness' in an FCC hearing which was a frightening experience as the opposing lawyers tried to show that I was not qualified to design the

AM antenna system to avoid interference. Fortunately my MIT background saved the day and the FCC approved our application.

I became a Registered Professional Engineer in the Commonwealth of Pennsylvania because we had a contract to oversee construction of a radio station in Warren. Several years later I became a Registered Professional Engineer in the District of Columbia also. I had taken a graduate mathematical laboratory course at MIT in graphical computation (pre-computer days). I was doing some acoustical design of broadcast station studios at Colton & Foss and had a paper published in the journal *Electronics* in April 1947, entitled 'Reverberation Time Nomographs.' It was included in a book, *Electronics Manual for Radio Engineers* by Vin Zeluff and John Markus, published by McGraw-Hill in 1949.

General Colton built a small laboratory and got a contract from Motorola to design a 'Citizens Radio' at a new frequency of 470 Mhz. I was making progress and built a model, but it was too large and heavy really. At the end of the first year the General called Jack and me in to his office and told us that he couldn't give us a raise as the firm was barely surviving. We accepted the situation but persuaded him to buy a big ad in Broadcasting, the industry's trade magazine. We designed a clever ad (we thought) with my picture and Jack's picture and words that said that we were the two reasons why any prospective broadcaster should ask Colton & Foss to design their station. As it turned out, General Colton was invited by ITT to become the President of the Federal Telecommunications Laboratory in New Jersey and our firm broke up. I resigned immediately as I did not like Mr. Foss, who was more of a salesman than an engineer. He offered me a $1000 bonus to work for him but I felt it was time to move on. Jack stayed with him.

Operations Research Analyst, Office of Naval Research funded Operations Evaluation Group at the Massachusetts Institute of Technology; Franklin Institute; and University of Rochester.

I began hunting for a job. One of my friends suggested that I apply for a job in a small research group at the Navy Department since he thought that I might know the director, a professor on leave from MIT. I followed up on his suggestion and ended up working for the next fifteen years for MIT's Division of Sponsored Research.

But first a word about my friend, John Coyle. A few months after I arrived at the Huancayo Magnetic Observatory in October 1939, I read in

the alumni news section of the Technology Review that there was an MIT chemical engineer, Tom Terry, Class of 1936 working at the smelter of the Cerro de Pasco Copper Company at Oroya, altitude 12,000 feet about 90 miles north of Huancayo. In fact the railroad line built by the British about 1896 went from Lima to Oroya. Then a branch went north to terminate at the actual copper mine at Cerro de Pasco, altitude 13,000 feet and another branch came south to terminate at Huancayo, altitude 11,000 feet. I wrote to Tom to say hello and he invited me to come to Oroya and he would show me the smelter.

When I visited him he introduced me to his friend, John Coyle (John later went to MIT in 1948-49 to study geology). John's father was David Cushman Coyle, a famous economist and popular author, who was a personal friend and economic adviser to President Roosevelt. John had gone to Princeton for two years but the Depression had forced him to transfer to Antioch College in Yellow Springs, Ohio. Antioch had a cooperative-type of program where student could find themselves a job in alternate semesters and earn enough money to work their way through college. John was very clever and won an award for 'Best Young Metallurgist of 1939' for a scientific paper he had published. Anyhow, Tom, John and I did a variety of things together for the next two years I was in Peru. We went mountain climbing. The train from Lima went through a pass at 15,900 feet so we would start from there and climb the nearby peak to 17,300 feet roped together. At MIT I had belonged to the Outing Club and we had gone on a number of joint trips with folks from the Harvard Mountaineering Club to learn rock climbing and climbing on pretend glaciers in winter climbs on Mount Washington with crampons, cutting steps with our ice axes, etc.

We were invited by two members of the Harvard Mountaineering Club in 1941 to attempt to climb a 18,860 foot mountain called Huagoruncho (written up in the 1943 *American Alpine Journal*). We didn't make it, but it was finally climbed years later by one of the members of the original British team to climb Everest. We went fold boating. The Mantaro River, one of the headwaters of the Amazon River had its origin at a glacier about 100 miles north of Cerro de Pasco. The river was continuous white water for several hundred miles as it passed by Oroya and Huancayo. We went spelunking, which I didn't like that much as it involved crawling around not knowing where we were. We helped some amateur archeologists explore some ancient cliff dwellings.

In May 1942, German submarines were sinking American ships faster than they were being built. The US Navy Department before World War II was generally considered more security conscious than the War Department. The idea of civilians knowing the Navy's secret war plans and warship fighting capabilities and limitations was unheard of. The Navy had civilian physicists and chemists working at the Naval Research Laboratory and the Naval Ordnance Laboratory, but they were all working on technical problems not operational or intelligence problems. However, the Chief of Naval Operations had established an Antisubmarine Warfare Unit at the First Naval District headquarters in Boston. A Captain Wilder Baker was in charge. Captain Baker had just returned from several months in England observing how the Royal Navy was working to protect British ships from U-boat attacks. The British had established what they called an 'operational research group' of civilians headed by a Professor Blackett (Nobel prize in Physics 1948). Captain Baker went to MIT and asked Professor Philip Morse if he would be in charge of the secret scientific research for the Navy on operational and intelligence aspects of antisubmarine warfare. Professor Morse brought three of his physics graduate students and started to recruit other physicists, chemists, biologists, statisticians, and mathematicians for this new group. The first director of research was Dr. William Shockley (MIT Ph.D physics 1936, Nobel prize in physics 1956). Dr. Vannevar Bush's National Defense Research Committee tasked Columbia University to administer the group all through World War II. In August 1942, the group was given office space on the third floor of the Navy Department building on Constitution Avenue in Washington.

After the end of World War II, most of the 100 or so scientists went back to their universities to resume teaching. Columbia University was asked by the Navy to continue this Operations Research Group with about 20 scientists. Columbia declined and stated that they did not feel it would be appropriate for a university to administer a group doing secret research. Secretary of the Navy Forrestal then asked Dr. Karl Compton, President of MIT, if MIT would administer the post-war group for the Chief of Naval Operations. MIT agreed but had to change the wartime name of the research group to 'Operations Evaluation Group' to avoid confusion with the new Office of Naval Research.

I was looking for a job at the right time. Professor Morse, whose acoustics course I had taken at MIT, had just resigned because he had been asked to

establish the Brookhaven National Laboratory for atomic research on Long Island. The new director of the OEG was Professor Steinhardt of Columbia University who had been in the ORG most of the war. When he found out that I had been the Army Signal Corps project officer on 'identification, friend or foe matters,' he immediately offered me a job in July 1947 as an operations analyst. The scientific support of the evaluation of the latest post-war secret IFF Mark V equipment had just been assigned to the OEG.

I was only part way through the two year OEG orientation program for new analysts when I was sent in December 1947 to Norfolk, Virginia to be on the staff of the Commander, Operational Development Force. The Operational Development Force was the post World War II name of a group of ships and aircraft units which had been organized in Maine in 1945 to develop tactics to counter Japanese kamikaze suicide bomber aircraft attacks. Now OPDEVFOR had been assigned a project in 1947 to test the new IFF mark III system installed in fleet units.

OPDEVFOR was a sort of Noah's Ark type of taskforce organization, except it had only one, not two, of all major naval units. For example, it had one battleship, USS Mississippi, one light aircraft carrier, USS Saipan, one destroyer, USS Lyman B. Swenson, one submarine, etc. For tests of the IFF system, the plan was to ask the Commander, Naval Aircraft Atlantic for a total of 126 aircraft. Operational control of these aircraft would be assigned to COMOPTEVFOR for about a week in June 1948.

The commander of this taskforce was Rear Admiral Briscoe, an Annapolis graduate with a distinguished career in battleships in World War II. He was from Louisiana and fishing was his hobby. When I was told to go to Norfolk, John Everett (MIT 1937 Course VIII), the OEG field representative I was going to relieve, had given me directions to come to pier number 17 to a ship called USS Adirondack (AGS-12). This ship had been designed to be the headquarters control ship for amphibious invasions such as Iwo Jima. The ship had offices and conference rooms for both the Naval admiral and his staff in charge of the amphibious ships and the Marine general and his staff in charge of the assaulting Marines,

Admiral Briscoe and his entire staff of about 40 officers and yeomen were on this command ship. It is interesting that at that time the major seagoing commanders and their staffs were all aboard command ships. There were no staffs in permanent buildings ashore at the Norfolk Naval Base. Commander in Chief Atlantic Fleet and his staff were on the USS

McKinley (AGC-08), and Commander Amphibious Forces Atlantic and his staff were on USS Mount Shasta (AGC-06).

When I found the ship, I parked my car on the pier and boarded the ship using the officers' gangplank. I found John Everett who introduced me to Admiral Briscoe's aide. The aide showed me the compartment which I had been given. It was originally assigned to the aide to the US Marine Corps general who was in command of the Marines who were to make the amphibious landing. It was a small but comfortable cabin with a double deck bunk, a desk and a chair. There was a safe built into the desk to hold secret documents, a cabinet for me to hang up my jackets and raincoat, and drawers under the bottom bunk to store clothes.

John said that our first order of business should be to pay a courtesy call on Captain Bergen, Chief of Staff. We climbed up to the next level where Captain Bergen's office was right next to the Admiral's flag quarters. We chatted with Captain Bergen for some time since he was very interested in my Army background as the project officer on IFF. He welcomed me to help design the evaluation testing of the new IFF system. After a while he said he would find out whether or not the admiral could fit us into his schedule. He returned in a few moments and said, 'The admiral would like to talk to you right now.' I was delighted that he was able to fit us in to his busy schedule.

However I was surprised when I entered his cabin to find him carefully putting away a lot of equipment to make fishing flies. After Captain Bergen had introduced me, the admiral asked me if I was interested in fishing. 'Not really,' I said. Then I explained that my father was stationed at Fortress Monroe across the Chesapeake Bay from Norfolk when I was nine years old until I was twelve. My Uncle Louis who lived in Washington, DC would come down to stay with us and go fishing for a week several times each summer. My uncle really took fishing seriously. He would buy a dozen soft shell crabs — not to eat but to use for bait. My mother though it was disgraceful to waste money like that. Then he would rent a fishing boat with its owner to take us out in the middle of the bay. I would get seasick almost every time, but my mother encouraged me to go. 'You'll get over it,' or 'The water will probably be calmer today,' or 'You won't get sick in a flat calm.' I would end up catching a couple 'croakers,' a not very distinguished looking fish which I disliked eating because it was full of small bones. I hated catching fierce looking, three feet long eels who always seemed to swallow the hook.

Admiral Briscoe then showed us the flies he had just made that morning. The most spectacular was a 'Royal Coachman.'

Experience:

Director of Disaster Services, American Red Cross, Carmel Area Chapter, Carmel, California, November 2000 to November 2001

Adjunct Professor, Institute for Joint Warfare Analysis, Naval Postgraduate School, Monterey, California, May 1998 to May 2000.

Assisting in research on development of models of response by local governments to acts of terrorism involving chemical-biological weapons of mass destruction.

Disaster Coordinator, Pacific Grove Fire Department, City of Pacific Grove, California, January 1990 to October 2000.

Responsible for disaster preparedness for the City of Pacific Grove. Duties included: initiating emergency preparedness programs, revising and updating the City's Multi-Hazard Emergency Plan, designing the City's Emergency Operating Center, writing Emergency Operating Center Standard Operating Procedures, planning and conducting the City's exercises such as the participation in the annual statewide earthquake exercise each April, conducting public education programs, writing the City's Radio Amateur Civil Emergency Service Plan, organizing local amateur radio operators in the City's RACES group, teaching and organizing the City's Volunteers in Preparedness (neighborhood emergency response teams), and training all City employees in the State's Standardized Emergency Management System (SEMS).

Senior Scientist, VRC Corporation (formerly Evaluation Technology, Inc.), Monterey, California

Research on command and control systems, total quality management, and test and evaluation. Research on mass transit system emergencies.

Deputy Executive Director/Chief Scientist, Planning Research Corporation, Fort Ord, California

Management of a 200 person ($10 million dollar) contract with the U.S. Army to administer the Scientific Support Laboratory of the Combat

Developments Experimentation Center at Fort Ord and Fort Hunter Liggett, California.

Senior Scientist, KETRON, Inc., Arlington, Virginia

Research on U.S. Navy command and control communications systems. Research on emergency operations centers both aboard ships and at shore headquarters.

Amateur Radio

Amateur radio operator participating in emergency communications at my amateur stations, K6FVH, W3EJK, W1ILE, KC6TUW, KO6IA and currently K6FVH. President (1996) Naval Postgraduate School Amateur Radio Club.

Chapter 6
Broadcast Station Design Engineer, Colton & Foss – 1946 to 1947

Just before I became a civilian in 1946, Major General Roger B. Colton who had been in charge of Signal Corps research and development all through World War II called me into his office and asked me if I had a job lined up. When I said, "no," he invited me to work for him. He told me that he was going to go into partnership with a Mr. Bill Foss, a consulting engineer who had designed radio broadcasting stations before the war. He told me he was asking another Signal Corps Captain, Jack Moffett to come also. He said he would pay us the same salary that we were getting as captains.

My Professional Engineer photo, 1946.

I had a very interesting year at the new Colton & Foss, Inc. offices at 15th and K Streets NW, learning to be a consulting engineer designing AM and FM broadcast stations. I participated in the design of broadcast stations and preparation of engineering reports for applications to the Federal Communications Commission for the following stations: AM at Great Falls, Montana; AM at Renton, Washington; AM and FM at Fort Worth, Texas; and AM and FM at Seattle, Washington. I appeared as an Expert Witness in a FCC hearing which was a frightening experience, as the opposing lawyers tried to show that I was not qualified to design the AM antenna system to avoid interference. Fortunately my MIT background impressed the Hearing Judge and saved the day, and the FCC approved our application.

I became a Registered Professional Engineer in the Commonwealth of Pennsylvania in 1947 because we had a contract to oversee construction of a radio station in Warren. In 1951 I became a Registered Professional Engineer in the District of Columbia also.

I had taken a graduate mathematical laboratory course at MIT in graphical computation (pre-computer days). I was doing some acoustical design of broadcast station studios at Colton & Foss and had a paper published in the journal *Electronics* in April 1947, entitled "Reverberation Time Nomographs." It was included in a book, *Electronics Manual for Radio Engineers* by Vin Zeluff and John Markus, published by McGraw-Hill in 1949.

General Colton built a small laboratory and got a contract from Motorola to design a Citizen's Radio at a new frequency of 470 Mhz. I was making progress and built a model, but it was really too large and too heavy. At the end of the first year the General called Jack and me in to his office and told us that he couldn't give us a raise as the firm was barely surviving. We accepted the situation but persuaded him to buy a big ad in *Broadcasting*, the industry's trade magazine. We designed a clever ad, with my picture and Jack's picture and words

that said that we were the two reasons why any prospective broadcaster should ask Colton & Foss to design their station.

About that time, General Colton was invited by International Telephone and Telegraph to become President of the Federal Telecommunications Laboratory in New Jersey and the firm broke up. I resigned immediately as I did not like Mr. Foss who was more of a salesman than an engineer. Besides, I thought that he was beginning to become an alcoholic.

I had gone to Warren, Pennsylvania with Mr. Foss to help him measure the antenna patterns that we had designed. When we checked into the hotel in Warren, Mr. Foss telephoned room service and ordered a bottle of whiskey and full dinner for the two of us. A few weeks later, one of his friends came to the office. He was shaking and trembling and apparently had the DTs (delirium tremens.) He told Mr. Foss that his wife had locked him out and could he stay at the Foss's for a few days. Mr. Foss looked at him and telephoned for an ambulance to take him to George Washington University hospital. He died two days later in the hospital.

Mr. Foss offered me a $1,000 bonus to stay and continue to work for him but I felt it was time for me to move on. Jack decided to stay with him. Mr. Foss died about three years later. Jack persuaded Mrs. Foss to sell the consulting business to him.

Chapter 7
Naval Operations Analyst – 1947 to 1978

I began hunting for a job. One of my friends suggested that I apply for a job in a small research group at the Navy Department since he thought that I might know the director, a professor on leave from MIT. I followed up on his suggestion and ended up working for the next fifteen years for MIT's Division of Sponsored Research.

Early History of Operations Research

In May 1942, German submarines were sinking American ships faster than they were being built. The U.S. Navy Department before World War II was generally considered more security conscious than the War Department. The idea of civilians knowing the Navy's secret war plans and warship fighting capabilities and limitations was unheard of. The Navy had civilian physicists and chemists working at the Naval Research Laboratory and the Naval Ordnance Laboratory, but they were all working on technical problems not operational or intelligence problems.

However, the Chief of Naval Operations had established an Antisubmarine Warfare Unit at the First Naval District headquarters in Boston with Captain Wilder Baker, USN in charge. Captain Baker had just returned from several months in England observing how the Royal Navy was working to protect British ships from U-boat attacks. The British had established what they called an operational research group of civilians headed by a professor from Birmingham University, Professor P.M.S. Blackett (who later won the Nobel prize in Physics in 1948). Captain Baker went from Boston across the Charles River to MIT in Cambridge and asked Professor Philip Morse in the Physics Department if he would establish and be in charge of a new secret scientific research group for

the Navy to work on operational and intelligence aspects of antisubmarine warfare.

Professor Morse brought some of his physics graduate students including Jim Tyson, Ralph Beatty, and Joe Neuendorfer, and started to recruit other physicists, chemists, biologists, statisticians, and mathematicians for this new group. The first director of research was Dr. William Shockley (MIT Ph.D physics 1936 who won the Nobel prize in physics in 1956). Prof. Morse built the group up to strength of about 70 scientists between 1942 and 1945. He went to various universities and invited the Chairman of the Statistics Department at Columbia, the chairman of Columbia's Chemistry Department, the Chairman of the Biology Department at Harvard, and a number of bright physicists, chemists, mathematicians and the American chess champion to join the group.

Professor Morse has written a book which describes these beginnings of military operation research in the US. (Morse, Philip M. *In at the Beginnings: A Physicist's Life.* Cambridge, Massachusetts: The MIT Press, 1977) Note: Professor Philip Morse taught physics at the Massachusetts Institute of Technology from 1931 to 1969. I took his acoustics course in 1937 and later went on to do acoustics research for my Master's thesis in the Electrical Engineering department.

The beginnings of American military operations research should therefore be credited to Dr. Morse and the half dozen physics graduate students he took with him in April 1942 when Captain Baker of the U.S. Navy in Boston asked him to help the Navy on operational antisubmarine warfare problems, not just the *technical* problems of underwater acoustics he and the students had been working on.

The National Defense Research Committee (NDRC) was established in June 1940, more than a year before we entered the war, as a part of the executive office of the President of the U.S. It was headed by Dr. Vannevar Bush (former Vice-President of MIT) to mobilize American scientists, primarily from universities, to help prepare for the war. After we

entered the war in December 1941, the President set up the Office of Scientific Research and Development (OSRD) which included the NDRC and a Committee of Medical Research. An electronics countermeasures lab was established at Harvard. The California Institute of Technology built the Jet Propulsion Laboratory, the University of Chicago had an atomic energy research laboratory which built the first nuclear reactor, and MIT built a radar laboratory called Radiation Laboratory. Dr. Karl Compton (President of M.I.T.) was in charge of OSRD's Field Service Branch, with Columbia University administering Dr. Morse's antisubmarine warfare operations research group at the U.S. Navy's headquarters in Washington, D.C.

When the first physicists, chemists, biologists and mathematicians reported to the Navy in Boston in April 1942, according to Morse, they were shown a room full of safes containing reports from antisubmarine ships and aircraft crews. The research group politely told their Naval hosts that they didn't want to read any reports, and said that they wanted first to just sit down and think about the problem. They then proceeded to discuss among themselves what actually happened when German submarines attempted to sink American merchant ships and what sorts of countermeasures might be tried to thwart these attacks. They soon developed a "search theory for aircraft" for night operations when aircraft searched with airborne radar for the submarines charging their batteries on the surface, and for daytime operations when aircraft searched for periscopes with both radar and visual observers. A similar search theory was developed for sonar-equipped destroyers and other naval ships searching for submerged submarines.

When they finally got around to reading the official Naval reports, they found lots of interesting narrative information, but very little quantitative information of any value for their search theory. They then asked for permission to visit the operational Naval Bases, but the Navy initially suggested that they could bring all kinds of Naval officers to Boston to answer any questions the scientists might have. The group

said, "no," and finally received permission to visit bases. They quickly convinced the operational officers that scientists could be of help and soon developed a system of sending someone to work at the Eastern Sea Frontier Headquarters in New York for six months, to the Gulf Sea Frontier Headquarters in Miami, to the Caribbean Headquarters in San Juan, Puerto Rico later in Trinidad, etc. Soon they were invited to go on operational flights to see for themselves the details that had never got into the reports.

The central research group was moved to Washington, D.C. from Boston in June 1942. With rotation of analysts out to the field commands and back, information became available to both strengthen the new search theory and to indicate to the radar engineers at the Radiation Laboratory the actual performance of ASW radar in the field under the conditions of operational patrols.

The research on operational aspects of antisubmarine warfare was so effective that the U.S. Navy eventually invited the operations research group to work on other problems, such as submarine operations, air defense of ships, naval air operations, amphibious assaults, shore bombardment, etc. By mid-1943, Dr. Morse and Bill Shockley, Director of Research, had recruited 44 people, including 18 physicists, 14 actuaries, 6 mathematicians, 3 chemists, 2 biologists and an architect. Analysts took turns going to commands in Newfoundland, the 4th Fleet in Brazil, 7th Fleet in Australia, the ASW Tactical Development Unit at Quonset Point, Rhode Island, and Fleet Air Wing 2 in Hawaii. By the end of World War II, the group had grown to about eighty analysts.

My Life as an Operations Research Analyst

I did not work in this secret group with all these famous people during the war. I was on active duty in the Army since I had received a Reserve Officer's commission in the Signal Corps when I graduated from MIT.

My photo submitted to the United States Air Force Brigadier General Promotion Board.

Dr. Vannevar Bush's National Defense Research Committee had asked Columbia University to administer the group all through World War II. In August 1942, the group was given office space on the third floor of the Navy Department building on Constitution Avenue in Washington.

After the end of World War II, most of the 80 or so scientists went back to their universities to resume teaching. Columbia University was asked by the Navy to continue to administer this Group with about 20 scientists. The named had been changed to Operations Evaluation Group (OEG) to avoid confusion with the new Office of Naval Research. Columbia declined and stated that they did not feel it would be appropriate for their university to administer a group doing secret research. Secretary of the Navy Forrestal then asked Dr. Karl Compton,

President of MIT if MIT would administer the post-war group for the Chief of Naval Operations. MIT agreed but was asked by the Navy to change the name of the post-war research group from "Office of Scientific Research and Development (OSRD) to "Operations Evaluation Group" (OEG) to avoid confusion with the new Office of Naval Research (ONR). The Office of Naval Research would give a research grant to MIT's Mathematics Department to administer the group

I worked for 30 years as an operations research analyst on Office of Naval Research grants. The first phase was 15 years in the Operations Evaluation Group administered by the Mathematics Department at MIT. Then the second phase was a five year period when the Office of Naval Research gave the grant to the Franklin Institute of Philadelphia. The third phase was for about ten years when the University of Rochester received the ONR grant. I had a series of field assignments to Naval and Marine Corps commands. Most of these assignments were, in OEG's style, alternating a year or two in Washington with six months or a year being a guest on some Admiral's staff in a Fleet unit. My field assignments were to the following commands:

> Commander, Operational Development Force, Norfolk, Virginia Commander-in-Chief, Pacific Fleet, Pearl Harbor, Hawaii Commander, Operational Test & Evaluation Force, Norfolk, Va Commander, Sixth Fleet, afloat in the Mediterranean Sea Office of Naval Research, Washington, D.C.
> Commander, Naval Forces, Far East, Yokosuka, Japan
> U.S. Marine Corps Headquarters, Arlington, Virginia
> Naval War College, Newport, Rhode Island
> Commander-in-Chief, Atlantic Fleet, Norfolk, Virginia
> USMC Landing Force Development Center, Quantico, Virginia
> Commandant, USMC, Arlington, Virginia
> Naval Tactical Data Center, White Oak, Maryland

Commander, ASW Forces, Sixth Fleet, Naples, Italy
National Security Agency, Maryland

I should point out that the U.S. Navy's World War II use of civilian operations research scientists was different from both what the U.S. Army and the U.S. Army Air Forces did during the War.

U.S. Army Operations Research

As a matter of fact, the U.S. Army during World War II had no organized operations research groups. After the war, the Army signed a contract with Johns Hopkins University on July 20, 1948 to set up an operations research group of 150 or so professionals, the "Operations Research Office" (ORO). Dr. Ellis Johnson, Director, reported to the Deputy Director for Research and Development, Logistics Division, Army headquarters. During the Korean War, ORO had a sub-group of 45 scientists in Korea but all in a clump. After about thirteen years, the Army cancelled the contract with Johns Hopkins University on September 1, 1961. The Army then set up an operations research group called "Research Analysis Corporation" (RAC) with General Omar Bradley as chairman of its board. The U.S. Army supervision of this new contract was a responsibility of the Chief of Research and Development. Eventually, after some years, the U.S. Army cancelled this group.

The U.S. Army also established a number of in-house "operations research groups" (actually for scientific research rather than research on operations) in the Army's technical branches, such as Ordnance, Signal Corps, Quartermaster Corps, Medical Corps, Chemical Warfare Corps, Transportation Corps, and Corps of Engineers. The Army gave a contract to American University to establish a "Special Operations Research Office" for area cultural studies stressing sociological and psychological implications of war, particularly in Southeast Asia. George Washington University was given a contract to administer a "Human Resources Research Office" for operations research on human factors pertaining

to soldiers. A "Combat Operations Research Group" located at the Continental Army Command, Fort Monroe, Virginia operated by a contractor, Technical Operations, Inc., applied operations research techniques to problems of organization, tactics and doctrine for the present and future Army. Finally, Stanford Research Institute furnished a group of statisticians and engineers to assist the Army's Combat Development Experimentation Command in the design of experiments and statistical analysis of data involved in testing of new equipment and tactics for the Army at Fort Ord, California.

The Army began sending officers to civilian universities such as Case-Western Reserve to study civilian operations research and also sent officers to the Naval Postgraduate School to study for a Master's degree in military operations research.

U.S. Army Air Forces Operations Research

The Army Air Forces followed the progress of the U.S. Navy which had copied many of the procedures of the Royal Navy. The RN Numbered fleets and their special commands such as Coastal Command each had a small group of scientists reporting directly to the Admiral in charge. The scientists were mostly university professors of physics, chemistry, biology, mathematics, statistics, etc. The Universities had essentially stopped teaching for the six years of World War II. Since most engineering professors were busy designing and building ships, sonar, fire control equipment, aircraft, bombs and things, there were relatively few enginering professors in these "Operational Research" groups.

The British finally ran out of university scientists and went to the UK Patent Office to find people with scientific training. The patent examiners all had to be lawyers with scientific training in physics, chemistry, biology, electrical engineering, mechanical engineering, etc.

When the U. S. Air Forces in England inquired as to the composition of British Operational Research Groups, they mistakenly got the impression that most of the researchers were lawyers with scientific training. This information was

duly forwarded on to the Air Force Headquarters in the Pentagon. Winston Churchill is reported to have once said, "Great Britain and America are two great nations divided by a common language." The U.S. Air Force Headquarters apparently heard "Lawyers" and missed "with scientific training." The action taken was to appoint the Dean of the Harvard Law School (rather than a scientist) to be in charge of all Air Force operations research groups. Each numbered Air Force such as the 8th Air Force stationed in England had a small group of lawyers and a few statisticians in an OR group. Each group established an elaborate statistical reporting system (collection of evidence) as to number of bombing missions flown, number of various types of bombs dropped, number of bombers shot down by antiaircraft fire, number of bombers shot down by German fighters, etc. The daily and monthly statistical reports were sent to Air Force Headquarters in the Pentagon. This heavy handed collection of statistics was a completely different approach to the U.S. Navy's use of scientific research to develop methods to detect and sink submarines and how to increase the transport of men, ammunition, and material across the oceans.

Also, the OR group at the 8th Air Force at High Wycombe in England was completely separate and had little contact with other Air Force OR groups. Each group was simply an addition to a General's staff to collect statistical data for Washington and to do whatever the commander wished. This was in contrast to Dr. Morse's policy, where the Navy had agreed that the scientists should look at the operational problems, decide for themselves which problems they thought were important and that they might be able to be of assistance on and get on with their research.

After the Navy Department and War Department were reorganized into the Department of Defense in 1947, the new U.S. Air Force set up separate operations analysis groups at the Air Force Headquarters, Strategic Air Command, Tactical Air Command and a dozen other commands. Again each group was essentially autonomous. The Air Force also set up

the RAND Corporation in Santa Monica in 1948. The Air Force sends officers to study operations research at the Air Force Institute of Technology and the Naval Postgraduate School.

One important lesson I think we might learn from operational research during World War II was that the OR groups which were accepted by the military and really accomplished things contained first class scientists led by first class scientists. The British operational research groups that the U.S. Navy copied apparently were full of people with exceptional scientific talent. The Royal Army's 30 man Air Defense Research and Development Establishment had such folks since eight became Fellows of the Royal Society, and one became the President of the Royal Society and also won the Nobel Prize in physics.

I was looking for a job at the right time. Professor Morse, whose acoustics course I had taken at MIT, had just resigned because he had been asked to establish the Brookhaven National Laboratory for atomic research on Long Island. The new director of the OEG was Professor Steinhardt of Columbia University who had been in the ORG most of the war. When he found out that I had been the Army Signal Corps project officer on "identification, friend or foe" matters, he immediately offered me a job in July 1947 as an operations analyst. The scientific support of the evaluation of the latest post-war secret IFF Mark V equipment had just been assigned to the OEG.

Once again, a lot of changes. A new job working for MIT's Division of Sponsored Research with overall supervision by Professor George Wadsworth of the Math Department. And Benjamin Paul Coile, our third son was born on August 17, 1947 at Suburban Hospital in Bethesda, Maryland.

I was only six months through the usual two-year OEG orientation program for new analysts in Washington when I was sent in December 1947 to Norfolk, Virginia to be on the staff of the Commander, Operational Development Force for six months for the IFF testing project. I would drive down the 200 miles from Bethesda to Norfolk each Sunday afternoon

and return home on Friday afternoon. During the week I lived aboard the flagship, the Adirondack (AGS-12). The Operational Development Force was the post World War II name of a group of ships and aircraft units which had been organized in Maine in 1945 to develop tactics to counter Japanese kamikaze suicide bomber aircraft attacks. Now OPDEVFOR had been assigned a project in 1947 to test the new IFF Mark III system being installed in fleet units.

OPDEVFOR was a sort of Noah's Ark type of task force organization except it had only one, not two, of all major naval units. For example, it had one battleship, USS Mississippi (BB-41), one aircraft carrier, USS Saipan (CVL-48), one destroyer, USS Lyman B. Swenson (DD-729), one submarine, Requin (SSR-48), etc. For tests of the IFF system, the plan was to ask the Commander, Naval Aircraft Atlantic for a total of 126 aircraft. Operational control of these aircraft would be assigned to COMOPTEVFOR for about a week in June 1948 for the graduation event of the test program.

The commander of this taskforce was Rear Admiral Briscoe, an Annapolis graduate with a distinguished career in battleships in World War II. He was from Louisiana and fishing was his hobby. When I was told to go to Norfolk, John Everett, MIT 1937 Course VIII Physics, the OEG field representative I was going to relieve, had given me directions to come to pier number 17 to the COMOPDEVFOR flagship the USS Adirondack (AGS-12). This ship had been originally designed to be the headquarters control ship for amphibious invasions such as Iwo Jima. The ship had offices and conference rooms for both the Naval admiral and his staff in charge of the amphibious ships and the Marine general and his staff in charge of the assaulting Marines, and all sorts of radio rooms.

Admiral Briscoe and his entire staff of about 40 officers and yeomen were on this command ship. It is interesting that at that time the major seagoing commanders and their staffs were all aboard command ships. There were no staffs in permanent buildings ashore at the Norfolk Naval Base. Commander in

Chief Atlantic Fleet and his staff were on the USS McKinley (AGC-08), and Commander Amphibious Forces Atlantic and his staff were on USS Mount Shasta (AGC-06).

When I found the ship, I parked my car on the pier and boarded the ship using the officers' gangplank. I found John Everett, who introduced me to Admiral Briscoe's aide. The aide showed me the room which had been assigned to me. It was originally assigned to the aide to the US Marine Corps general who was in command of the Marines who were to make the amphibious landing. It was a small but comfortable cabin with a double deck bunk, a desk and a chair. There was a safe built into the desk to hold secret documents, a cabinet for me to hang up my jackets, other clothes, and raincoat, and drawers under the bottom bunk to store clothes.

John said that our first order of business should be to pay a courtesy call on Captain Bergen, Chief of Staff. We climbed up to the next level where Captain Bergen's office was right next to the Admiral's flag quarters. We chatted with Captain Bergen for some time since he was very interested in my Army background as the project officer on IFF. He welcomed me to help design the evaluation testing of the new IFF system. After a while he said he would find out whether or not the admiral could fit us into his schedule. He returned in a few moments and said, "The admiral would like to talk to you right now."

I was delighted that he was able to fit us in to his busy schedule. However I was surprised when I entered his cabin to find him carefully putting away a lot of equipment to make fishing flies. After Captain Bergen had introduced me, the admiral asked me if I was interested in fishing. "Not really," I said. Then I explained that my father was stationed at Fortress Monroe across the Chesapeake Bay from Norfolk when I was nine years old until I was twelve. My Uncle Louis who lived in Washington, DC would come down to stay with us and go fishing for a week several times each summer. My uncle really took fishing seriously. He would buy a dozen soft shell crabs – not to eat but to use for bait. My mother thought it

was disgraceful to waste money like that. Then he would rent a fishing boat with its owner to take us out in the middle of the bay. I would get seasick almost every time, but my mother encouraged me to go. She would say, "You'll get over it," or "The water will probably be calmer today," or "You won't get sick in a flat calm." I would end up catching a couple of fish called croakers, a not very distinguished looking fish which I disliked eating because it was full of small bones. I hated catching fierce looking eels which always seemed to swallow the hook.

The "Identification, Friend, or Foe" tests went extremely well. Equipment was installed on all of the ships and a large number of naval aircraft. After numerous tests with small units, a large test was scheduled with about 150 aircraft which came to the Norfolk operating area from bases from Quonset Point, Rhode Island to Key West Florida. This test was designed to determine if a large number of aircraft would saturate the whole system and cause a catastrophic breakdown. I had an interesting six months assignment to the Navy's Operational Development Force in Norfolk and then I was recalled to Washington so that another analyst could be assigned to the Operational Development Force.

B-52 Bomber Self-Defense

I presented a paper, "Combat Information Center Problems under consideration by the Operations Evaluation Group" (Listed in Appendix C Professional Papers and Presentations) at the 1947 Fleet Air Defense Conference held in August by the Chief Of Naval Operations. I then wrote OEG Study No. 337 "Air Defense by Control of Interceptor Aircraft" in August 1847 (Listed in Appendix C). I was therefore nominated by the Director of the OEG to attend an Air Force conference on defense of future bombers.

I met Charles Lindbergh at this conference in Air Force Headquarters on August 23, 1948 which is a date that I must tell my grandchildren about. The Operations Evaluation Group had been studying the problems associated with air defense protection of naval aircraft against attacks by enemy

jet aircraft. The speeds of jet aircraft were so much higher than the speeds of propeller-driven aircraft that our fighter aircraft had difficulty in visually sighting a closing enemy aircraft in time to maneuver into a firing position. The Air Force during World War II had the B-17 bomber equipped with machine guns mounted in the aircraft's nose, a top turret, a ball turret sticking through the bottom of the fuselage, a waist turret on either side of the fuselage, and finally a tail turret. No wonder it was called the "Flying Fortress."

The purpose of this conference was to consider how many machine gun turrets should there be on a future bomber called the B-52 which was being designed. I reported on experimental visual trials designed by Dr. Eddie Lamar, our OEG expert on visual problems. The COMOPTEVFOR trials had a bomber (simulated by a Naval fighter) flying a straight course. A fighter was directed by a shipboard controller to the general vicinity to attack the bomber. The trials were conducted at various speeds: 300 knots, 400 knots and 500 knots, resulting in closing speeds between 600 knots and 1000 knots when the aircraft were approaching head to head. At detection, the time and distance apart were recorded. I don't remember all the numbers, but at closing speeds above something like 800 knots there was not enough time for the fighter aircraft to fire at the bomber. Lindbergh and the other officers asked me a lot of questions about our trials, and then decided that only a tail turret should be designed into the B-52. Six months later in January 1949, I presented a paper, "Analysis of some ComDevFor Interceptions" at the 1949 CNO Air Defense Conference.

Back to MIT for more Graduate School

My life as an operations research analyst continued for the next 30 years with a cycle of a year or two in Washington, then a field assignment to a Naval Command for six months or longer, then back to Washington, etc. I had been two years in the Operations Evaluation Group when I was sent on a sabbatical to MIT for the school year of September 1949 to June 1950. These sabbatical years were designed to help analysts

like me who did not have a Ph.D work towards getting one, or to give the folks with a Ph.D the chance to get away from secret Naval research for a year and do unclassified research or write a book, etc. I was in luck. MIT had found that a number of engineering students had been in graduate school for five or six years, but for a variety of reasons had not been able to finally complete their Ph.D dissertation. It was a big disappointment to them to have to leave school to get a job with nothing to show for the past five years. Therefore, MIT decided to award a sort of consolation prize, a professional degree, "EE" (Electrical Engineer) to people who had finished taking a zillion courses but had not been able to complete research on their dissertation. I had to take a comprehensive oral exam, which I passed, and then was awarded the EE degree at graduation time in June 1950. I was the second individual at MIT to receive an EE.

I had a hard time and was really busy learning how to be a student again after ten years out of school. Ruth and I plus our three children rented an apartment in Brookline across the Charles River from MIT. Russell Jr. was in first grade in an excellent school. He came home with a lot of homework every day. A member of the Boston Symphony and his family lived in the apartment house on the floor below our fourth floor. He played the oboe and practiced several hours each day. I was at MIT or Harvard each day so it didn't bother me but it was rather unwelcome for Ruth. They had a son who was a freshman at Harvard. He wrote a composition for his English class, "My Mother married an Oboe player." The instructor didn't like it, found all sorts of grammatical errors in it and gave him a poor grade. He mailed it to the Saturday Evening Post which published it and sent him a check for $1,000.

I rode a bicycle to MIT or Harvard every day. I went to classes and labs at MIT on Monday, Wednesday, and Friday. I was taking several math and computer classes at Harvard so I rode to Harvard on Tuesday, Thursday and Saturday. Professor Howard Aiken at Harvard had assigned our six person computer class a term project to design a low cost

computer. We spent considerable time working out the computer's name. We finally settled on Simple Arithmetic Digital Sequential Auxiliary Computer (SADSAC). One of my classmates was famous. George Reitwiesner had come to Harvard to work on his Master's degree after working on a computer designed and built at Harvard for the Ballistics Research Laboratory at the Army's Aberdeen Proving Ground in Maryland. George had received permission to use the Harvard Mark II computer during the Christmas holidays when the whole Lab closed down for several days. George persuaded his girlfriend (whom he later married) to help him compute Pi to 2,000 places. Some English mathematician had computed Pi to 500 places by hand back in 1850, but this was a new world's record. George showed us letters he had received from Dr. John von Neumann, one of the most famous American mathematicians at the Institute for Advanced Study at Princeton, New Jersey thanking George for giving him a copy of the 2,000 number sequence which he was examining for randomness.

I decided to see if I could get some non-secret professional papers published just to keep my research in information science alive. I was invited to give a paper, "A Library Machine for Chemical Literature" at a national meeting of the American Chemical Society at Chicago. The Institute of Radio Engineers asked me do some consulting for them, arranged for me to have a research assistant, and I published an article, "Periodical Literature for Electronic Engineers" in the Proceedings of the I.R.E. Next, the General Electric Science Forum invited me to fly to Schenectady to give a talk, "A Mechanized Library" on their broadcast on radio station WGY. The other person giving a talk on their Science Forum that evening was a gentleman who was one of the two GE scientists who had developed seeding clouds to produce rainfall. I was traveling in distinguished company!

Now, a sad note. Ruth was bored, started drinking and actually left me to go to Woods Hole with some guy the week before exam week. I packed up all our children's clothes

and drove non-stop to Maryland to ask Ruth's mother to take care of the three children while we tried to work things out. I managed to pass all my exams. I was late for my last exam and forgot to use my lock to fasten it to a sturdy fence. Someone stole my beautiful bike. I packed up everything and moved back to Bethesda. Ruth finally decided to come back to me after a couple of months. The guy she had moved in with drank even more than she did.

Korean War

Then a big international event! In June 1950, the North Korean Army invaded South Korea. Thousands of soldiers captured Seoul, the capital city of South Korea within a week as the poorly organized South Korean army troops hastily evacuated Seoul and fled south to avoid being captured and becoming prisoners of war. However, thousands were captured and put into POW camps.

The American army troops stationed in South Korea in 1945 after the end of World War II were poorly organized, poorly trained and poorly equipped units. For example, at the end of World War II there were a number of labor or stevedore companies in Japan. These were companies with black soldiers with white officers. They were originally stevedores to unload ships. By a stroke of a pen, these stevedore companies were redesignated "combat infantry" companies. However, even though they were all issued rifles, knapsacks and other things like hand grenades, they were not given appropriate training. Many were not even given rifle marksmanship training. They were not given the psychological training for combat. One can be critical of the U.S. Marine Corps for its boot camp training where the Marines take ordinary civilians and turn them into combat troops within a few months. Some people call this process too brutal but the Marines spend a great deal of effort indoctrinating every Marine into believing that he is a warrior and if he is shot, his buddies in his squad will always rescue him and get him to a field hospital. If he is killed they will always manage to get his body back to friendly areas so that his parents can give him a proper burial.

The stevedore troops received none of this training or bonding process. When the North Korean Armies advanced, the troops would take off their combat boots so they could run away faster, throw away their guns, etc. You can read all about it in books such as Clair Blair's "The Forgotten War." There are not many books written about the Korean War (which we lost) because most Americans want to forget the dismal facts of this war.

The North Korean Army had been augmented by 300,000 Chinese Army troops, but General MacArthur wouldn't believe this. General MacArthur in Japan with the title of Supreme Commander of American and U.S. troops in Japan and South Korea had an intelligence officer, a General Willoughby who did not believe the reports that came to Japan about people in Chinese Army uniforms who had been captured by American units in Korea. "They are only a few volunteers," he told General MacArthur. Actually, about 300,000 regular Chinese troops, not volunteers, had crossed the Yalu River which divides Manchuria from North Korea. The Americans did not have any airplanes in South Korea and no American air bases. The U.S. Air Force flew from Japan to try to fly reconnaissance missions during daylight hours. The Chinese troops would set fire to rice fields to make smoke to make it impossible for the U.S. airplanes to detect trucks in parking areas camouflaged with tree branches during daylight hours. Then at night the Chinese Army trucks could drive south on roads using their headlights because the U.S. Air Force did not fly at night.

In October 1950, the Operations Evaluation Group was asked to send four analysts to Hawaii. We would be research folks for the "Pacific Fleet Evaluation Group" which was to be a group of about a half dozen Naval and Marine officers with an Admiral. We would have a small office at the Submarine base at Pearl Harbor. John Coyle and I were the first two OEGers to get to Hawaii and we were put on a cargo airplane which was scheduled to take off to go to Japan within a couple of hours because our orders gave us a high priority. We slept on sacks of mail. The other high priority passengers were radiomen.

The naval communication system had crashed because of the volume of messages. There were backlogs of thousands of messages piled up in the naval radio stations at places like Guam. These were four engine propeller planes so that we had to stop for refueling a number of times. We stopped at Midway Island, Guam, the Philippines, and Okinawa before we arrived at the US Navy's airfield at Atsugi, Japan. We took a naval bus to Tokyo and reported in to Rear Admiral Arleigh Burke at the offices of the Commander Naval Forces Far East. He told us how to take the train to Yokosuka, the old Japanese Imperial Naval Base at the entrance to Tokyo Bay. The USS Philippine Sea (CV-47) an aircraft carrier was preparing to leave the next day to return to the Sea of Japan to provide close air support to American Army and Marines fighting the Chinese in Korea.

Rear Admiral Edward Ewen was the commander of Task Force 77 which consisted of two large carriers, USS Philippine Sea (CV-47) and USS Valley Forge (CV-45), two small carriers, two cruisers, four destroyers, two oil tankers and two ammunition replenishment ships. The Admiral slept in a small sea cabin off Flag bridge. He invited John and me to be his guests at evening dinner in his in-port cabin which could seat a dozen for meals. He normally had dinner with his senior staff; his air operations officer, surface operations, intelligence, fleet logistics, etc. John and I ate breakfast and lunch in the Officers' Wardroom with all the other officers aboard ship. We were each assigned a vacant upper bunk in some officer's stateroom so that we had a place to keep our clothes and a desk for writing our reports. We were aboard ship to collect data on the task force operations and problems, and collect suggestions for improving operations which we would write up for the Commander of the Pacific Fleet when we returned to Pearl Harbor with our data.

The carrier-based aircraft were flying missions over Korea providing air support to American, British, Turkish, and other United Nations troops and South Korean troops fighting near the 38° latitude parallel. This was legally a United Nations

Police Action to make the North Korean Army go back up North and stay out of South Korea. The UN did not want to provoke China into formally entering this UN police action and turning it into the beginnings of World War III. However, lawyers at the UN finally decided that the U.S. Air Force and the U.S. Navy could attempt to destroy the five bridges across the Yalu River to keep more Chinese troops out of Korea. However, these same lawyers decreed that there could be no overflights of Manchuria by U.S. aircraft. This meant that all attacks on bridges had to be flown under the difficulties of flying down the Korean side of the middle of the river to drop bombs instead of flying down the line of the bridge which would be the normal way to attack a bridge. Neither U.S. Air Force or U.S. Navy carrier based aircraft were able to destroy the bridges. Years later, the Russians admitted that there were 10,000 Russian air defense troops at the Manchurian end of these bridges, firing anti-aircraft guns at the U.S. planes dropping bombs on the bridges. Both John Coyle and I asked the Admiral's permission to fly on bombing missions to observe. There were two electronic countermeasure aircraft in the Air Group, AD4-Q which carried a back-seat countermeasures equipment operator behind the pilot. I got checked out in how to operate the A/N APR-1 radar intercept receiver. It was my first launch from a carrier. I was wearing a waterproof suit and a life preserver in case our plane got shot down and landed in the water. The water was so cold I would freeze to death within 20 minutes, a crewman cheerfully told me. The 5-inch antiaircraft shells firing at our plane in its 45 degree dive to release our 1,000 pound bomb were glowing red as our plane lost altitude quickly in its dive. We didn't hit the bridge with our bomb but we did make it back to the carrier for a safe recovery.

Our Pacific Fleet Evaluation Group Admiral back at the Submarine Base at Pearl Harbor sent each of us a naval message telling us to return to Hawaii as soon as possible to write a report covering the first six months of the war so that Admiral Radford, Commander of the Pacific Fleet could be

briefed on our progress to date. John Coyle and I stayed about a month in Hawaii and finished writing our reports by New Year's day 1951. OEG in Washington sent two additional OEGers out to join us. John Everitt (a physicist from MIT '37) and Dr. Jim Dobie, (a mathematician from Northwestern). John and Jim amazed people by sitting on the beach at Waikiki under an umbrella doing research on queuing problems of ships waiting to unload cargo at ports such as Yokosuka, Yokohama, and Sasebo. None of us could understand Jim's integration of the product of two Bessel functions.

The Intelligence Officer on the Pacific Fleet staff at Makalapa, came down to the Sub base one day to talk to us about a problem. U.S. submarines were sent sometimes into the Sea of Okutsk to try to detect Russian submarines departing from Vladivostok. He wondered if the U.S. Air Force radar station at Wakkanai, on the northern tip of Hokkaido might be able to detect Russian submarines transiting on the surface through La Perouse Strait between Japan and Sakhalin. The Russians had taken Sakhalin and the Kuril Islands away from Japan the day after the end of World War II. I jumped at the chance to go to Wakkanai to visit the radar station to examine their detection logs. My hidden agenda included the possibility of visiting an Ainu village in Hokkaido if I had any spare time.

Meanwhile, since our small office was at the Sub Base I had met some officers on a U.S. submarine named Pickerel (SS-524) when I visited them to meet the officers and see what their capabilities were for passive countermeasures receivers to detect Russian radar signals. These officers invited me to go out on a one day training exercise with them so I could see a submarine at work. Actually in the exercise they were pretending to be a Russian submarine attacking an ammunition ship being protected by four American destroyers. They thought that it was hilarious that they were entertaining a civilian at lunch at a depth of minus 300 feet going 18 knots astern to shake off and lose the destroyers. The commanding officer of the Pickerel was Commander Ralph

Schwartz, and the executive officer was Lt. Cdr. "Pappy" Sims. Ralph was famous in the Navy – he was a wild man which is desirable for wartime ops when the person is considered a hero. In peacetime he might be court-martialed for some of his escapades.

For example, once he was sailing submerged on a routine snorkeling voyage from Pearl Harbor to Hong Kong. His submarine received a message giving him an arrival date and time and assigning his sub a berth. However there was a garble in the message and the arrival date was several days earlier than was possible with usual cruising speed. But, if they speeded up the diesel engines to go considerably faster than their legal top speed, they might just make it. Instead of questioning the message, Ralph decided to "go for broke" as Hawaiians say. He set the world's record for longest (5,000 mile) completely submerged fastest snorkeling submarine trip ever. In another famous event, he arranged for a submarine whose captain was a friend of his to be waiting on the surface with several photographers while the Pickerel was at minus 400 feet. Usually a submarine comes to the surface by slowly blowing water out of its ballast tanks and rising to the surface at a small angle between 5 to 10 degrees at a slow speed. Ralph blew all the water out of the ballast tanks and emerged at full speed from minus 400 feet at an angle of 54 degrees. The Commander of Submarines Pacific immediately sent a message to all submarines forbidding this extreme maneuver because it might break the submarine's back. Then, a few weeks later, Commander SubPac sent Ralph a message asking him for thirty 8 inch by 10 inch enlargements of the historic 54 degree photograph instead of court-martialing him.

A few days after my at sea trip, one of my new friends from the Pickerel came to our office and invited me to participate in the crew's annual exercise to practice escape from a sunken submarine. At the Submarine School at New London, Connecticut and at Pearl Harbor are Escape Training tanks. These tanks are 100 feet high. The entire crew of a submarine from commanding officer to the cook participate.

Small groups enter the bottom of the tank through an escape lock and then rise to the top of the tank using a device called a Momsen lung. There are several safety divers with scuba tanks of air who are floating around at different depths in the tank to help anyone who apparently is getting into trouble. My friend arranged for me to have a complete physical exam to check out my lungs before participating. Fortunately (for me) I failed the physical as soon as the doctor found out about my childhood asthma. However John Everitt decided to participate. He never forgave me for getting him involved since he found it to be a really frightening experience.

Our group of Officers and us civilian analysts flew back to Japan the first week of January, 1951. When I checked in with Admiral Arleigh Burke in Tokyo, I told him that the Intelligence Section at Pearl Harbor had suggested that I visit the radar station at Wakkanai. He agreed and told me that he had spent a few days aboard an American sub in La Perouse Strait a month earlier when it was on station to try to detect Russian subs. I made arrangement to go by train from Tokyo to Misawa in the north of Honshu where I got off at the railroad station and got a ride in an Air Force truck to the Misawa Air Force Base. I stayed there overnight and the next morning the Air Force flew me up to Hokkaido. The Army operates a train once a week carrying people and supplies to make a circle of all Army outposts on Hokkaido It took me right to the Air Force radar site at Wakkanai. I had bought skis from an IBM civilian that I had met in Tokyo because there was at least five feet of snow in January all over Hokkaido. I spent a week living and working at the radar site. The meals were ok American food. I would work from about 9 am until 4 pm examining months of radar detection logs to see if the radar had detected Russian submarines running on the surface in La Perouse Strait. I could tell which was which from the speed of the contact since the airplanes were usually going 200 knots and ships and submarines only 10 knots or so. I would quit about four, put on my skis and ski into the small village of Wakkanai. It was a port with several piers for fishing boats. I found it fascinating to watch a fishing boat arrive and

tie up at one of the piers. The crab cannery would have a horse (wearing an overcoat and eating something hot out of a nose feed bag) with a harness to a sled which carried a large open box. The fishermen would use pitchforks to throw giant crabs from the boat up on to the pier. Then a cannery worker would put the crabs into the box. Once a worker picked up one leg of a crab and held it over his head to show me how the other legs were still on the pier. They thought it was hilarious that I had never seen such large crabs before. This friendly worker used sign language to invite me to accompany him and horse plus sled to the cannery a hundred yards away. The cannery building had a half-dozen women workers all bundled up in overcoats on each side of a large table. They were friendly and were laughing as I watched their "assembly line." The crabs were first boiled for a while and then dumped on the table. The women would take a can and fill it with three sections of crab– the bottom and top sections were large pieces of crab while the middle section consisted of smaller bits. There was one man with a hand-operated machine which put the top of the can on. Another man pushed a container with numerous cans into a cooker. When the cans had finished cooking, they were brought out of the cooker and a woman would glue labels on the cans.

As I was skiing back to the radar site to eat supper in the mess hall I saw several ten year old boys on skis. Other boys each had a dog harnessed to a small sled. But the most interesting event for these ten year olds was to have a long pole and be poling themselves around on a small ice berg in shallow water. I heard a woman standing outside the door to a small house shouting something. Although I don't understand Japanese, I could just imagine that she was shouting something like "Ichiro, you get off that iceberg this minute and come home before your father gets home from work!"

Ainu Anthropology

After a week at the radar station, the train came through on its regular schedule. Now I would have a week of R&R to see if I could find some AINU. I had heard of the AINU when

I went to high school in Honolulu. The AINU are a stone-age aboriginal people who were in Japan in 660 B.C. when the Japanese arrived from the Chinese mainland. They are almost extinct now with only about 14,000 left. They are of unknown origin, of Caucasian-type features, the men heavily bearded, fairly light complexioned and do not look like the Japanese at all. I had been inserting the word "Ainu" into the conversation with everyone I had met since arriving in Japan ten days ago in the hopes of getting information. I discussed the Ainu with Admiral Burke, with all the Air Force people I had met recently, with intelligence people, and with casual strangers I met on the train. For example, the bartender at the Air Force base at Chitose on Hokkaido reported that an Ainu was one of the KP's in the mess hall. It was too late in the evening for me to see him, however, there is supposed to be an Ainu village at Shiroai down on the south coast of Hokkaido. There are also reported to be villages at Hiratori and Sinukotu according to Kyosuki Kindaiti's book, "Ainu Life and Legends" which I read at the Library of Hawaii. He also reported an Ainu village at Wakkanai. If it were there years ago, it isn't there now, for I spent two days there looking for it, without success. I even stopped an old man with a beard I met as I was tramping down the road into town Monday night, February 19, and asked him if he knew of any Ainu living near Wakkanai. He thought it was very funny that I was probably wondering if he were an Ainu. After a mile of walking together, we came to his house where he invited me to come in. It was the first time I had been in a Japanese house so I eagerly accepted. It turned out that he was the keeper of the shrine of the Fishermen's God - Konpira. He wrote down the God's name and his name for me and an interpreter told me the following about the "GOD KONPIRA" – "This God is the God for all Japanese seaman and fishermen. The main God is at Sikoku, Konpira beach, the captain and crew present much money in a small box and throw this box into the sea. Afterwards the beach fishermen get the box and send this to

Konpira Shrine. This box was not stolen before." (Has never been stolen)

I borrowed one of John Batchelor's books - "Ainu Folklore and Legends." Batchelor was a missionary from London who worked with the Ainu for years, beginning in 1877. Batchelor's book was marvelously illustrated - paintings of Ainu clothes, houses, hunting weapons, etc., and lots of legends. The present authority, I am told, is Father Gearhart Huber, a German Franciscan in a mission in Sapporo.

I spent two marvelous days at the Ainu village in Chicabumi. When my train arrived at Asahigawa on Tuesday, February 20, I was met by an interpreter, Mr. Jukei Miyakita, who is an English teacher at the Asahikawa Hokuto Junior High School, 16-Chome, 7-Jyo Asahikawa, Hokkaido, and a guide Mr.K. Shimiza, from the Japan Travel Bureau with a car complete with driver and footman (courtesy of the city of Asahikawa). What a way to explore! The American, Mr. Kelley Gay of Army Occupation Sub-Headquarters at Sapporo had asked some friends in Asahigawa to get the interpreter and a guide for me. We drove across the river into Chicabumi and parked the car at the Hokkaido Gakugei University, a teachers college. We then walked about ¼ of a mile down river on a path to the Ainu village. Kaneto Kawamura, grandson of Chief Monokute Kawamura has an old Ainu house as a museum beside his Japanese-style house. The snow was drifted up to the eaves and the thatch roof had a couple feet of snow on it so one couldn't see much. The door had a big drift in front of it. Kaneto Kawamura was up in the mountains so we weren't invited in. We went on another two blocks or so and came to the house of Hiroski Kawakami. He has two Ainu huts. He invited us in and showed us a collection of Ainu things handed down from his grandfather. His grandfather's coat is over a hundred years old. It is made of "bark" with blue designs. The belt and sword belt were also of "bark." I am not sure when they told me "bark" that they actually didn't mean wood. Batchelor's book describes how they make the coats but I don't remember the details. The swords are shorter than

Japanese samurai swords and have holes and engravings on the blade which the Japanese swords do not. Since the Ainu are Stone Age culture, they apparently bartered furs, etc. with somebody to get the swords.

The women's coat was of the characteristic Ainu cut with smaller sleeves than Japanese kimonos, and decorated with a sort of scroll work. The headband for women also has these scrolls Fleur de Lys, convex diamonds, etc. on a piece of black silk about two inches wide. The man's headband is two strips of woven bark about an inch and a half wide fastened at the back and fastened in the front with a carved wooden bear's head sticking forward about two inches.

They wear straw or bark sandals with ties around the ankles in summer and use sandals with soles of salmon skins in winter in order not to slip on ice. Their mats of bark have red and black strips inlaid to make patterns. They dip the mats into a hot spring to set the color of the inserts. Their bows are decorated with strips of dark red cherry bark wrapped for about 5 turns spaced about 19 inches. The arrows were short being only about 15 inches long and made of some wood with bamboo front end of 4 inches with a bamboo point tied on. They also used poisoned arrows. A dagger was made of bear bone with bamboo point. They showed me a big log that had a hollowed out space for grinding corn. Two men alternately pound it with the end of a small log 4 inches in diameter and 2 feet long. The center of the small log is of small diameter for a handgrip.

I wanted to find out something which hasn't been recorded thus far so I investigated Ainu folk dancing. The legends, the religion and the animal worship have been very thoroughly recorded by Batchelor who got old people to tell him in 1880 (70 years ago), the ancient tales. But being a missionary, he wasn't interested in dancing. Naka Kawakami, the mother of Hiroshi, was asked if she would show us some Ainu dances. She was initially embarrassed and very shy, but finally showed us five dances. I wrote down their names and made

plans to come back alone without the entourage of interpreter and guide.

The Ainu had only one musical instrument, the "nukkuru." I didn't see one, but Hiroski Kawakami drew a picture for me. It is made of bamboo and has a split reed that vibrates and sounds like a jews harp. I heard a recording of it at the broadcast station in Asahikawa later that night. Each nukkuru has a characteristic sound and it was used in courting. A young man would play his nukkuru at night outside a girl's hut and if she recognized it as belonging to the right boy she would come out. Curiously enough, a Guamanian tried to sell John Coyle and me some Truk Island "love sticks" last October when we were on Guam. The Truk Islanders carry a staff, about 7 or 8 feet long with the top two feet carved in a characteristic style. When a boy is courting he sticks this spear in thru the window of the girl's hut. If the girl recognized the feel of the carvings as belonging to the right boy she came out, but if the spear belongs to someone she doesn't want to bother her ever again she breaks off the point of the spear.

I bought a girl's Ainu coat for 2000 yen ($5.56) from some friend of old Naka Kawakami. Then she sold me a headband she had made 20 years ago. The coat was stated to be 15 to 20 years old also. I collected these Ainu clothes to donate to the Smithsonian Institution in Washington, which I did.

It was snowing too heavily to take pictures, so I was pleased to find that my Ainu host, Hiroski was a photographer. He showed me his album and I bought two sets of pictures he sells to tourists. Actually he makes his living by wood carving, so I bought several of his little walnut bears. He then showed me his captive bear, about a year old in a cage in one of his huts. They always try to catch bear cubs when they go hunting and raise them until they are about 2 years old when they sacrifice them in a Bear Festival. The Ainu now only put on these Festivals for tourists, charging admission, etc. Only two old ladies (over 70 years old), have tattooed faces in the classical Ainu style. Hiroski and the other chief Ainu, Kaneto Kawamura are both married to Japanese girls. The Japanese

Government has given the Ainu the land for their village, and they have full equality with Japanese, go to the same schools, etc.

This Ainu village of Chicabumi is near Asahikawa, as I mentioned previously. I was interested to discover that in spite of the fact that Asahikawa is the fourth largest city on Hokkaido with a population of over 100,000, only 129 Americans had stopped in the city, even for a brief interval to change trains, between July 2, 1950 and February 20, 1951. I felt that I had imposed enough on my interpreter, guide, driver, etc. so we retraced our path to Asahigawa. They delivered me to the American intelligence officials who had arranged for a room in a Japanese hotel for me. As we were riding in a jeep towards the hotel, I asked them where the local radio station was as I planned to go there after supper. They insisted on taking me there as it was several miles out of town. When we got to the station I asked the manager if he had any records of Ainu music and if he had any extra records he would let me buy. They had about 30 records there, but he wouldn't let me have any of them. I listened to several and wrote down their names. They are all put out by the Japanese Columbia company - the Institute of Character Section (I imagine that this really should be translated to the Ethnological Folk song section or something like that). I copied down the numbers of five Upopo - or Bear Festival songs.

I was not able to locate a record for the Dance of the Cranes although the radio station claimed that it was included in the 30 records. They played me a record they had cut of Ainu stories with a nukkuru twanging away at appropriate places in the tales.

The Americans then dropped me at the Echigoya Hotel. As no one there understood a word of English and my Japanese vocabulary can be counted on my fingers I looked forward to an interesting time since this was the first time I had been in a Japanese hotel. I didn't realize until it was too late that I was being treated like royalty and given a western-style room, the equivalent of the bridal suite, instead of a Japanese-style

room. I took off my ski boots in the foyer and put on slippers that were lined up waiting for the guests. My room had a big double bed, an easy chair, three straight chairs, a round table, three small tables, a wardrobe, a vanity, a corner whatnot and a couch built like a psychiatrist's consultation couch. A little round wood-burning stove sat in the center of the room. A bay window five windows wide faced the street and there were two windows on the side. My maid brought in some wood and a pan of hot coals to start the fire. It was amazing how rapidly the room warmed up. The maid took my coat off and hung it up and then put a kimono, or rather two kimonos on me. Then the water was already boiling so she brewed me a cup of tea and brought in a piece of pastry. Then she indicated that I must take a bath before supper. I dug up soap and a towel and she led me off to a dressing room for the bathroom. Several men were undressing, each with a little tray for storing our clothes. Then I went into the adjoining bathroom. There were three other men bathing. First you sit on a little bench and use a wooden bucket to pour water over yourself, then soap yourself, and then pour more water over yourself to rinse off. After you are all washed and clean - then you get in the tub to just soak. The tub is deep and this one was big enough for 4 people.

Supper was served in my room. I had tempura fried shrimp, crabmeat, raw fish (ugh), rice, soup and tea. The maid came in and built a fire at 8 the next morning and woke me up. She brought a cup of coffee and then some fried eggs and toast. I finally changed from kimono to ski clothes and set out to ski to the Ainu village. The temperature was about 20 degrees F. and the three feet of snow was packed down hard in the streets. Actually I didn't need to ski. I could have gone most of the way by taxi, streetcar, bus, bicycle, horse drawn sled or dog sled. Since it was still snowing (it snowed constantly all the time the two days I was there) skiing seemed like the most fun. It was less than two miles, particularly since I skied cross-country as soon as I crossed the river. I found the Ainu village without any difficulty and made a courtesy call on

Chief Kaneto Kawamura. He was back from the mountains. He invited me in and I gave some cigarettes to him and some candy to each of his three children. His Japanese wife was very pretty. The wife in Japan, when introduced, gets down on her knees and bows gracefully so that her head almost touches the floor. The baby was only about 18 months old, and his mother was teaching him how to receive gifts - both hands making a cup instead of grasping, then bowing and saying – *arigato* – thank you. Kaneto Kawamura didn't have a nukkuru. He showed me six Ainu kimono and some fancy necklaces. His necklace had the same black and green stones but had a copper disc about three inches in diameter as a pendant.

I went on and bumped into old Naka Kawakami walking down the path. She was surprised to see me but I gave her a king-sized orange and some cigarettes and told her I came back to learn how to dance the Upopo from her. She led the way to her son's house, where we found him outside chopping wood. I gave some cigarettes to him and some candy to his two children and fruit and candy to his wife. She was polishing some of his walnut bear carvings. I arranged to buy some more bears since I had changed $10 into 3600 yen in town.

Naka Kawakami and I then practiced some Ainu dances for several hours. She is 55 years old but, danced with the tireless energy of a folk dancer. She had to sing the Ainu chants as we danced, too. Her curly hair was black without a trace of grey and she wore it long, hanging down her shoulders, Ainu fashion. By this time, incidentally, she had put on the Ainu woman's tattooing around the mouth (simulated with black ink) and her Ainu headband and big earrings in preparation for my taking her picture later on in the day. Her son and daughter-in-law and grandchildren formed an appreciative audience as we practiced. They all thought it very amusing, especially when I was learning the dances of the cranes when Naka and I were hopping around being cranes with Naka chanting and making crane noises - hhrrrruk, hhrrrruk, hrrrruk.

Ainu Dances

The dances I learned are as follows:

MAINOKO - UPOPO - Bear Festival dance.

Men and women in a circle facing inwards, feet together.

(l) All side step to left with knees slightly bent. Clap with right hand on top, hands crossed naturally, about mid-height between waist and shoulders.

(2) Bring right foot next to left & clap again. Repeat (1)-(2), moving clockwise. The chanting and clapping of the *Upopo* music set the tempo which is not too fast.

Since this Bear Festival lasts for three days and three nights (six being the Ainu magic perfect number) these dances go on for hours. Since bear worship involves offering food and sake to the bear and then drinking sake (including the bear's share), everyone eventually gets pretty inebriated.

ONAJU MAINOKO UPOPO - Bear Festival Dance.

Men and women in circle facing inwards.

(l) Half face right, step on left foot raising right foot behind left, stretch arms wide hands behind back.

(2) Bring feet together, clap hands in front at waist height raise clapped hands and then unclasp bringing hands to shoulder height. (3) & (4) same as (l) & (2) except half face left, step on right foot raising left foot behind right.

OKAI UPOPO - Bear Festival Dance.

Men in circle facing inwards holding upright sword in right hand, left hand held over heart, fist half clenched.

(l) Feet apart, knees slightly bent, suzie-Q to the left pushing sword hand (right) outwards at height midway between waist and shoulders.

(2) Suzie-Q to the right, pull sword hand back to chest.

HONEN UPOPO - Harvest Festival Dance

Straight line of women, feet apart.

(l) Cross right foot over left foot pointing toe; making sowing motion with right hand crossing in front of body, hand up at beginning, ending pointing down, forefinger slightly extended; left hand on hip, thumb back, forefinger pointing down, little finger slightly extended.

(2) Bring right foot back to place, and right hand back to place, facing up, partly clenched, elbow bent naturally.

Repeat (l) & (2). After sowing, chant tells when to start harvesting.

(3) feet together; knee dip; clap hands together low.

(4) feet together; raise up; bend backwards, look upwards, raising hands and touching shoulders. Repeat (3) & (4).

Naka said this dance was done only by women in a line. This seems reasonable in view of the fact that the women did all the gardening while the men did the hunting and fishing.

DANCE OF THE CRANES

I don't know the Ainu name of this dance. Four girls in a circle dancing, two others singing.

(l) Squat on right foot, left foot forward, hop forward clockwise and clap hands. After considerable hopping around as baby cranes,

(2) Gradually increase height, hold end of coat sleeves by clenching fists, arms handing down.

(3) Spread wings with right hand low towards center of circle, left hand high. Alternate with right high, left low.

16mm movies with audio recordings of the chanting would have been the way to preserve these dances for posterity but I didn't have that type of equipment. Naka then put on her Ainu clothes and her son put on his grandfather's coat, ceremonial hat, and sword and I took some pictures while it was snowing.

They told me that their year-old bear was too dangerous to let out of its cage when I suggested a group picture. Just last year, a bear got out of control and nearly scalped a little girl with one swipe of its paw. The poor child lived but doesn't have any hair on the back of her head, I was told.

Then Naka insisted I put on her son's Ainu clothes and have my picture taken with her. When I finally had to leave to ski back to Ashahigawa and catch my train Naka walked the two-miles into town with me to carry my carved bears. The bear mask was a wall plaque about 12 inches in diameter and the other carving was an angry bear leaning against a tree, all carved out of one solid piece of walnut. Naka is such a sturdy character I had to keep humping to keep up with her on my skis. Downhill I was all right, naturally.

When I returned to Hawaii with the other members of the Pacific Fleet Evaluation Group I was invited to present a paper, "A Visit to an Ainu Village," before the Anthropological Society of Hawaii on March 28, 1951. I hired a professional Hawaiian hula dancer to perform the Ainu dances I had taught her while I played the Ainu records. She had put on Ainu tattoo makeup with ink on her face, wore the Ainu clothes I had brought back to give to the Smithsonian, and she wore some Ainu jewelry which I had borrowed from an anthropologist at the Bishop Museum. During the question and answer period after my lecture, I found out that two of the Bishop Museum anthropologists had visited the same Ainu village about 15 years earlier.

I presented the clothes I bought from the Ainu to the U.S. National Museum of the Smithsonian (listed in the U.S. National Museum 1959 Annual Report, pp 126-127, published 15 August 1959 by the Smithsonian Institution, Washington, D.C.) I also donated a dozen or so recordings of Ainu folk music which I obtained from the Folklore Section of the Japanese Broadcasting Corporation to the Folk Music Division of the Library of Congress.

Back to the War

We went back to Hawaii for another month to write up and report on all that we had observed in our second tour in Korea. Then back to Japan for our third tour. I was again aboard Philippine Sea (CV-47) the flagship aircraft carrier of Task Force 77. There was a different Admiral aboard. John

Coyle and I were not invited this time to be part of the inner circle and eat dinner in the Flag mess.

Each carrier had two helicopters for plane-guard duty who would be airborne during every launching or landing flight operation to rescue pilots of airplanes which crashed either while being launched or attempting to land. More of our aircraft were being shot down by Chinese anti-aircraft fire than in the first months of the Korean War. If one of our planes was damaged the pilot would head for his carrier so that if he had to crash on land he hopefully would be a few miles from the Sea of Japan where one of our rescue helicopters could try to land and pick him up before he was captured by Chinese or North Korean troops. If the pilot were able to get his plane over water, he would try to get within a couple of miles from the carrier and then crash into the sea if he or the airplane was not able to land safely aboard the carrier. Hopefully the plane-guard helicopter would be able to pick the pilot up if he had been able to get out of the sinking aircraft and inflate his life raft. Our task force was losing almost one aircraft a day during the period from November 1950 to May 1951. The Philippine Sea lost two air group commanders during these months who were the lead aircraft in dangerous missions but the third air group commander, Cdr. Ralph Weymouth survived the war and became an Admiral.

When I asked if I could visit the Leyte (CV-32), the second large carrier in the task force, the Admiral's chief of staff agreed but pointed out that I could not go by helicopter because of all the life-saving tasking for the helicopters. He asked if I was agreeable to go by high-line as the Chaplains did to visit different ships to conduct religious services. In the high-line transfer, one ship sends a wire line to another ship about 200 feet away which rigs a chair with a pulley riding on the line. Then a group of a dozen sailors pulls a rope attached to the chair so that the chair goes from one ship to the other. If the weather is calm there are no problems, but in rough seas the chair and occupant may get dunked. I was lucky and had two successful high line transfers – the first

from the Philippine Sea to an oil tanker which was pumping aviation fuel (kerosene) to the carrier and the second, several hours later when it was the Leyte's turn to steam along next to the tanker to receive fuel. My luck held and I was ordered to climb aboard a helicopter which was making an unscheduled trip from the Leyte to the Philippine Sea.

My research project during my third trip to Korea was to investigate whether or not it would be more effective if Task Force 77 designated one aircraft carrier for only night operations while the other two carriers did only daytime operations. The existing system had a detachment of four AD-4N two-seat night configured aircraft on each carrier. Each carrier launched two of its detachment each night. This meant that hundreds of flight deck crew had to move 80 or so aircraft back on the flight deck for launching. Then they would sleep a little before someone woke them up about four hours later to move all the planes forward to clear the deck for landing the night planes at the end of their mission. Remember, this was in the era of straight deck carriers when all planes were moved back on the flight deck for deck run launches, and then moved forward of the safety barrier for landing aircraft.

In connection with my night fighting research assignment, I went ashore in South Korea in April 1951 to visit a U.S. Marine night fighting squadron, VFM (N)-542. They invited me to fly one night to see what their problems were. The aircraft was an F7F-2N night fighter. The F7F-2N actually was a reject from a Navy program for carrier based night fighters. The U.S. Navy had given it to the U.S. Marines after an official decision that it was not suitable for night carrier operations. The Marines were happy with it at first. It was painted black, had two engines and a radar operator's position in addition to the pilot's position. Frankly, although the regular radar operator had tried his best to teach me how to operate the radar, I just couldn't understand all the stuff I was seeing on the radar screen in front of me.

Major Jim Anderson, Squadron Commander and my pilot knew that this would be the case and told me not to worry. "I

didn't need the radar for this ground attack mission anyway. Just look out the canopy," he said. The Chinese and North Korean truck drivers were not afraid of one airplane in the sky and just drove down the roads with full headlights. Naturally, a few trucks turned their headlights off when they saw the airplane's machine guns flashing as my pilot strafed them. We had an uneventful mission, thank goodness.

A year later, another OEG analyst who had been assigned to do research for the Marine Air Group in Korea asked if he could go on a night attack flight. He was not so lucky. The Chinese must have installed machine guns on some trucks and they managed to hit the F7F-2N which was at low altitude strafing them. My friend, Dr. Irving "Spike" Shaknov (MIT '43) was in the radar operator's seat. The plane was shot down and crashed in enemy territory. No one knew whether or not the pilot or Spike had been killed or captured. The Navy and the Marines were very upset that an OEG civilian had been killed or captured on a Marine combat mission. The Navy asked Spike's parents not to tell anyone about the incident for fear that if Spike had been captured and was a prisoner he might have been taken to Russia by the Chinese for interrogation because he knew lots of secrets.

The Navy ordered the OEG to stop all of us analysts from flying on combat missions.

The Korean War finally ended about eleven months later. There was a formal exchange of prisoners which lasted several days. The South Koreans released about 10,000 North Korean and Chinese soldiers from Prisoner of War stockades. The North Koreans released about 5,000 American, British and Turkish prisoners of war. Spike's pilot, U.S. Marine Captain "Chief" Flynn (Native American) was released on the very last day of the prisoner of war exchange.

When Captain Flynn was being debriefed, he told the Marine intelligence officer debriefer that he did not know for certain, but he thought that Spike had been killed. He said, "After the plane had been hit by antiaircraft fire, I rolled the plane upside down, pressed the switch to have an explosive

blow the canopy off, and pulled my ejection screen to be ejected from the plane. I yelled at Spike on the Intercom to eject since I had coached him how to do it in an emergency, but I heard no answer." The airplane was so low that my parachute only had time to swing about three times before I hit the ground." MIT had insurance policies with Lloyds of London for $50,000 for each of us OEGers, because American insurance companies will not pay for deaths of civilians in military combat operations. Lloyds paid the insurance money to Spike's parents since he was not married. He was their only child so they gave the Money to MIT for a scholarship fund. I understand that the Operations Evaluation Group has a picture of Spike and a bronze plaque about him (the only OEG analyst ever killed while doing his research for the Navy) at the entrance to the OEG section of the Center for Naval Analyses in Alexandria, Virginia.

Suddenly a message arrived from Commander in Chief Pacific in Hawaii ordering our entire evaluation group to return to Pearl Harbor as soon as possible. Apparently General MacArthur had finally believed the intelligence reports about 300,000 Chinese troops having crossed the Yalu River from Manchuria. He was concerned that the American 8th Army troops were now retreating towards the South and trying not to be captured.

I managed to get a ride to Wonsan, North Korea on a "Carrier on Board Delivery" (COD) flight. The aircraft used was a former U. S. Navy World War II torpedo bomber. The Avenger TBM in wartime had a crew of three; pilot, bombadier, and rear gunner. As a COD it had a pilot and two passengers. We were able to get a ride from Wonsan back to Atsugi, Japan and then onwards to Oahu.

When I was finally able to return to Pearl Harbor I prepared my report recommending that Task Force 77 designate one carrier for night operations only. I found out later that a decision had already been made not to do this. The local scuttlebutt was that there were political aspects which I had not considered. Apparently the U.S. Navy wanted to send the

largest number possible of daily sorties to the Joint Chiefs of Staff, since these Naval number would be compared with the U.S. Air Force's numbers of daily sorties.

I also had some mail. A letter from Ruth said, "Dear Russell, I want a divorce. I have borrowed money from my mother to pay a lawyer who will arrange everything. I can either go to Nevada for three months to establish legal residence or I could go to Saint Croix in the U.S. Virgin Islands for six weeks. I have decided on a Virgin Island divorce. Just sign these papers. Ruth."

I am a very lucky person. I have made the right choice a number of times in my life and I have made the wrong choice only a few times. One of the bad choices was a hasty marriage a month after December 7, 1941 when World War II began for us after Japanese aircraft attacked the US Navy battleships at Pearl Harbor.

The other mail included instructions for me to return to Washington. The OEG was going to rotate other OEGers to the Pacific Fleet Evaluation Group and bring our original contingent home after our three tours in Korea.

England

A few months later I was told that I was being sent to England for three weeks. I would be the civilian scientist with three U.S. Naval officers to go to England to investigate a new air defense system. The Royal Navy had designed a pre-computer air defense system for aircraft carriers. The Comprehensive Display System (CDS was the code name) had a group of radar operators who looked for enemy aircraft on their radar scopes. If they saw something, they would put a special mark electronically, on the screen at each rotation of the radar usually every ten seconds to keep tracking the target.

On my second day in London, I telephoned a woman to whom I had a letter of introduction who was the secretary of an International Folk Dance group. I asked if she would be able to have dinner with me that evening and tell me about folk dance groups in London. She agreed and after dinner she

asked if I would like to see a rehearsal of Swedish dancing that very evening in the Inns of Court Mission.

At this rehearsal, I (as the visiting American) was introduced to a zillion people. One person in particular was outstanding. She was 21 years old (I found out later) and dressed in a Swedish costume. I did not have a chance to actually talk to her, but I was properly introduced - more on this later. I wanted to see her again so I managed to find out that this same group was going to have another rehearsal two nights later. I made up a story about going there so I could learn a particular Polish step and so I was told where to go, etc.

At the next rehearsal, I found out that her name was Ellen. I invited her to have lunch with me on the Saturday and then see the D'Oyly Carte's operetta, "Pirates of Penzance" by Gilbert & Sullivan. I had been one of the six second violins in my High School orchestra when we put on the Pirates. Talk about Happiness! I had met the most wonderful person in the world. I proposed the day before I had to fly back to Washington. That was 57 years ago.

My wife, Ellen Miller Coile, is the most fantastic woman I have every known. Ellen was born on February 13, 1930 in Sunderland, England. She was the youngest of six children – three boys and then three girls. Her father was Irish but because he died when Ellen was two, she didn't hear any stories about Ireland. Her mother was born just south of the border between England and Scotland of Scottish parents. Because she was raised "in the tradition" with Hogmanay (New Year's) special observances, eating porridge (Americans call it oatmeal), Ellen considers herself a Scottish Robson, a sept of the Gunn clan.

Ellen's father was an unemployed coal miner when Ellen was born. He walked to London where he found a job and sent for his family to join him when she was about nine months old. Ellen then lived in Ilford, Essex, just east of London until she was 9 years old. When I met her she lived in Hainault, the

village on the end of the Central Line of the underground if you remember the map of the Tubes – it was red.

In 1951, there was still much evidence of the destruction from the blitz. The rubble had been cleared away, and the authorities planted flowers and placed park benches on the bomb sites. The day before I had to fly back to Washington, I met Ellen on her lunch hour and we had a picnic in one of the bomb site parks in the heart of the City of London. I got down on my knees and asked Ellen to marry me. She said, "Yes," thank goodness. Then I asked her when we could get married. "Next year" she said to my dismay." "Okay, how about January 1, 1952," I asked her. Although my divorce had not yet been finalized I was legally separated. Ruth had gone to Saint Croix in the Virgin Islands and everything was on track for my divorce about September.

Ellen on the day I proposed to her in 1952 in a garden built on the site of a bomb crater cleared of rubble and made into a park for the Festival of Britain celebrations.

There are no memorials to the 34,000 people killed in the blitz or the 40,000 people killed by the V-1 (doodle bugs-flightless airplanes) and V-2s (rockets). None of the bomb site parks survived. As soon as money and materials were available, new buildings arose from the ashes.

I was busy working at the Naval Research Laboratory's Chesapeake Bay Research Site on the testing and evaluation of the British Comprehensive Display System. In October, I was asked if I would go on an OEG field assignment as the scientific advisor to the American Admiral who was Commander of the Sixth Fleet in the Mediterranean. I had an interesting time living aboard the Newport News, a heavy cruiser. I was assigned the spare upper bunk in the cabin of the fleet's meteorological officer.

The Sixth Fleet had a rotation of ships once a year. The flagship had a sort of home port at Villefranche, on the French Rivera. A number of wives of officers rented houses there.

Marrying Ellen

I asked the Admiral for ten days vacation at Xmas time so that I could fly to England and marry Ellen. We applied for a marriage license and found I had to be in the country five working days before we could get married. As there was Christmas Day, Boxing Day (26th December) and a Saturday and Sunday, it meant that the earliest we could get married was December 27. Ellen was Church of England, but her vicar told her that he could not marry us because I was divorced. Consequently we were married in a "Non-conformist" church — a Baptist church. We stayed in London that night at the Great Western Railroad Hotel at Paddington Station because that was the hotel I stayed at my first day in England when I met Ellen, months earlier. The next day we took the boat train to Paris because Ellen wanted to visit the Russian Orthodox church there on our honeymoon because she wanted to hear their famous choir in person. Then we took the train to Nice because I had promised the admiral that we would come to his New Year's Eve Dinner party. We traveled on the train in a "couchette" in second class to save money. There are six

berths in a couchette so that you don't really put on pajamas, etc.

Villefranche, 1952

One week to the day after our wedding, I had to go out to sea.

I had arranged for Ellen to drive to our next port of call with four other wives. When they got together to discuss the details of the trip, the other wives couldn't believe Ellen didn't know where we were going. They asked her how I thought she would get there without telling me where to go? She told them that I told her they would tell me. Apparently everyone in Villefranche knew the ship's movement; the bar girls, the ladies of the evening, the maid in the hotel, etc. The maid discovered Ellen didn't know where the ship was going or when it would return, so she made a point of telling her when she brought breakfast on the days the ship sailed. The ship's movements were classified information and I wasn't going to tell anyone where we were going.

The first time the ship went back to port, Ellen told me that she got up early to go to the end of the fishing pier to watch the ship come in. It was tiny at first but got bigger and bigger and when it was opposite her she claims she saw a small boat full of women go out and pull up alongside. The women got out and climbed up the ladder on the side of the ship. She ran around to the fleet landing and found the Admiral's barge there. His aide asked Ellen if she wanted to go to the ship. She said, "Yes please, I missed the other boat. I don't know what Russell will think of me." So they went out to the ship and Ellen climbed up the ladder, terrified as she is afraid of heights and the ship is 30-feet high. The Admiral's aide had a Marine take Ellen to the Officer's Wardroom, gave her a coffee, and then went to tell me she was there. I thought, *the ship is still moving and my bride is in the wardroom? This is just a joke on the newlywed.* So I took my time and strolled into the wardroom and nearly fell over when I saw Ellen calmly sitting there drinking a cup of coffee. Everyone insisted the boat full of women was a figment of Ellen's imagination. Word flashed

round the fleet that an English bride was onboard before the ship anchored.

The ship's visit to Barcelona was historic. This was the port of call that Ellen traveled to with the four other wives. It was going to be the first time an American warship had visited Spain in twenty years, since before the Spanish Civil War in 1936. The heavy cruiser USS Newport News was accompanied by the light cruiser USS Roanoke. When they got to Barcelona they had to use a Mediterranean moor: instead of docking alongside the pier they go stern in towards the quay wall – this way more ships can be docked in a smaller space. This is very difficult, especially if you don't do it very often. The Newport News managed the maneuver just fine, but the poor old Roanoke never did quite make it and had to tie up alongside the Newport News and gain access across her deck.

This gave Ellen a chance to gloat. When I was courting her and we visited the Festival of Britain we went by river bus. There was a lot of traffic and our boat was stopped opposite the Festival grounds waiting our turn to dock. The boat that was docking was having a hard time and had to make several attempts. I kept saying "I thought you were a nation of sailors, "best navy in the world," and other such disparaging remarks. When I finally got off the ship she gave me the same treatment. "Call yourselves sailors? You can't even moor properly." I couldn't blame her – it was done in jest and was just tit-for-tat.

This reminds me of an English Admiral who was watching from his bridge as one of his warships approached the quay wall to Med moor. As it seemed to be going perfectly he sent a flashing light message of encouragement, "Good." But apparently, and unbeknownst to the Admiral, the ship hadn't dropped her bow anchor in the right spot and without it to help slow them they continued moving backward until they smashed right into the pier, which elicited a second flashing light message, "God."

When we got to the Ritz hotel in Barcelona, our room was full of flowers – dozens of them. Ellen said, "There must be some mistake. They must be for someone else." But no, the card said, "For Mrs. Coile from the City of Barcelona. Welcome." This gave us a hint of things to come.

The whole city was agog with excitement at the ships' visit. Everyone wanted to get on board for tours during the hours when the ships were open to the public. The government was in the midst of negotiating for the United States Navy to open a permanent base in Rota and they were rolling out the red carpet to let us know that we would be warmly welcome.

When Ellen knew I would be visiting several countries in the Mediterranean with the ship she wrote to the London consulates of Spain, Greece, Turkey, and Italy to ask if there were any folk dance groups in the port cities. She got letters back and I was able to make contact with groups in several cities, including Barcelona. I was given a letter of introduction to a Catalan folk group. We went to their meeting and learned how to dance the Sardana – a dance that was danced in all the squares in Barcelona each Sunday. A list was published of who would be in each square, at what time and which band would be playing. We arranged to have a young couple (who spoke English) come to lunch on the Newport News and then take us to the squares to dance the Sardana. This was a great coup for them, as everyone wanted to get on board the American warships and they actually even got to eat a meal!

Ellen said she finally knew how the royals felt as we were scrutinized everywhere we went. The Catalans thought it amazing that we could dance the Sardana (it wasn't that hard, although I think the circle we joined dumbed it down a bit for the visitors). We danced all day, going from square to square, as the band in one finished we moved on to the next. A crowd would gather round to watch us dance. It was strange to be the object of such attention.

At the end of the day we took our guides to dinner back on the Newport News again. We were tired but very happy.

The reason we ate dinner onboard the ship was a minor culture clash over the correct hour to dine. Most Spaniards ate dinner at 9 o'clock. Americans then, as now, typically wanted to eat closer to 6:30. In Barcelona, the hotel management where we stayed was very understanding and agreed to open the dining room for us and the other Americans at 8:00, which they did. They opened the dining room, gave us bread and water, but didn't actually serve dinner until 9 o'clock. We just didn't know the Spanish way of life. Apparently they get up early, have a continental breakfast, work until about one and have a hearty lunch. Then they have a siesta – sleep for a couple of hours—then more work. Everyone is home at nine for the evening meal. As we were keeping Navy hours, we couldn't fit into their schedule very easily.

Ellen lived in Nice for several months as a paying guest of the Admiral's Flag Secretary. She didn't enjoy it because she was really treated as a nanny so she went back to England since I was going to be in Greek and Turkish waters for several months aboard the cruiser USS Newport News.

When my sixth fleet tour was over in June 1952 I said good bye to my Admiral and explained that I was flying to London to take Ellen to Washington with me. The Flag Secretary said he would send a message to the Navy Department asking for permission for my wife to fly on a Navy transport aircraft with me. My orders gave me permission as a civilian to fly on a Navy aircraft but didn't cover a civilian wife. When I got to London I went to the headquarters of the Admiral commanding Naval Forces Europe and asked the Admiral's Aide if I could call on the Admiral because the Sixth Fleet Admiral wanted me to tell him about some problems. The next day the Aide told me the good news a reply message from the Navy Department had given permission for Ellen to fly on a Naval aircraft on a space available basis. He said that the "Jokers" in Washington knew that there had been no space available for the previous two years. However, he said that his Admiral had told him to bump two Navy Department engineers off tomorrow's flight so that Ellen could go with

me. I met one of these Ordinance engineers about six months later who told me they were delighted to be bumped off. They had to go to Paris and wait for four days to get on an US Air Force flight.

Anyhow, I told Ellen to dress warmly in wool because we might fly to Patuxent River Naval Air Station on the northern route which meant flying to Iceland and then Labrador. Instead, the weather up north was bad so we went a southern route stopping to refuel in the Azores. When we got to Patuxent River, the temperature was about 80 degrees and Ellen melted Then we took a Navy bus for 74 miles to Washington through share cropper farms with several rusting automobiles in their front yards – a little different from the Hollywood version of beautiful farms.

Ellen and I settled down at 4323 Rosedale Avenue in Bethesda. Ellen qualified for a job at the British Embassy on Massachusetts Avenue. She became the secretary to the Embassy's accountant whose hobby was writing chess problems. She got a ride to and from the Embassy with the former British consul to Nepal whose wife had to be carried in a sedan chair for several days to get there since there were no roads for cars at that time.

After three years or so, Ellen went to Suburban Hospital in Bethesda where Jennifer was born. Dr. Norton and the Canadian nurse allowed me into her room to hold her hand during delivery. Ellen and I had attended classes on drug free delivery. We met an interesting couple in these classes – Cyril and Mabs Mango. We kept in touch with Mabs for over 50 years. Cyril was a Byzantine scholar working at Dunbarton Oaks, a Harvard research center in Washington. He and Mabs got divorced about ten years later and he went to teach at Oxford.

Japan 1954-1956

When Jennifer was nine months old, I was asked by the Director of the Operations Evaluation Group to go on a field assignment in Yokosuka, Japan as the OEG Field rep/scientific

advisor to the Admiral whose official title was Commander Naval Forces Far East.

To get to Japan, we loaded our suitcases and Jennifer's crib into our station wagon and drove from Bethesda to Oxnard, California where we stayed with the OEG rep at Point Mugu Naval Air Station which tested air launched guided missiles. We camped in national parks en route to California. Ellen thought we would never get through Texas – it seemed to take five days. We sold our car within two days after we got to Oxnard, and took the Greyhound bus to San Francisco. We went to the President Line ticket offices and bought first class tickets for the 13-day trip from San Francisco to Yokohama stopping in Honolulu for one day. In those days, flying was so much more expensive, that they didn't seem to care it took us two weeks! I had to pay for Ellen and Jennifer's fares as in those days, all OEG field assignments were unaccompanied. About six months into our tour the rules changed and we were reimbursed for our expenses. On the trip we met some missionaries who had gone to the President Line ticket office in Oakland to buy steerage class tickets at one quarter of the price we had paid. The President Line justified this deliberate misinformation by explaining that first class type people were not accustomed to eating rice three times a day.

Yokosuka was the World War II fleet headquarters of the Imperial Japanese Navy. I worked in a cave dug out of a small mountain. Intelligence officers had their compartment full of secret information about Soviet ships and submarines. Ellen and I lived in a small Japanese style house in Kamakura, a 20 minute train ride from Yokasuka.

A Japanese home is different because there is no, repeat, no, furniture in it. At night we would slide back a paper closet door and take out our sleeping bag to put on the floor, which is two inch thick rice straw covered with reeds. We "cheated" because we had brought Jennifer's crib with us. We also cheated by having a small round dining table mounted on skis and four small chairs also mounted on skis so that the

legs would not stick down through the tatami covering the rice straw.

My wife, Ellen, daughter Jennifer, 9 months old, and I arrived in Yokohama, Japan in July 1954, after the 13 day voyage from San Francisco aboard the SS President Wilson of the American Presidents Line. We were met by a friend who had made a reservation in a small hotel in Yokohama. This hotel had a special arrangement for foreigners. The owner assumed (correctly) that Americans were not accustomed to eating Japanese food, including rice at each of the three meals every day. For a small fee we were allowed some space in the hotel kitchen's refrigerators and were allowed to cook our own American style meals on the kitchen stoves. We could buy American food at the commissary on the American Naval Base.

The next day, I took the train to Yokosuka about 30 miles away. Yokosuka was a navy town. During World War II it was the fleet headquarters of the Japanese Imperial Navy. There were a number of office buildings, barracks for enlisted men, a bachelor officers quarters, an officers club, a non-commissioned officers club, an enlisted club, a base exchange where you could buy chinaware and Rolex watches, a hospital, and a commissary where you could buy canned goods, food and vegetables that were not fertilized by honey buckets containing "night soil," another name for human waste.

I had a small office in the main administrative building because I was the civilian scientific advisor to the Admiral who had the grand title of Commander, US Naval Forces in the Far East. The Admiral had his office in the building and a conference of his staff officers (including me) every morning at 0800 (8 am to landlubbers).

Most of each day I worked in the Command Cave. The Imperial Navy had brought in coal miners to dig out a big cave in a tiny mountain on the base. Inside the cave was a large two story wooden office building with numerous offices and conference rooms. The cave was built during the early months of World War II to protect the senior Imperial Navy

staff against being killed by the US Air Force bombing raids which effectively burned down most of Tokyo, Yokohama, and lots of Japanese cities with factories manufacturing airplanes, ships, tanks, rifles, everything the Japanese Army, Navy and Air Force needed.

One had to have a secret clearance to be admitted to the Command Cave which had US Marines guarding the entrance. I was working with some young intelligence officers who had been assigned to collect intelligence on our big enemy – the Russians.

I was assigned to observe a Naval war game exercise for two weeks. I boarded an aircraft carrier in Yokosuka which was to be the flagship of the Naval task force. There were some American submarines pretending to be Russian submarines and the enemy air force consisted of US Air Force planes flying out of the Philippines and Guam pretending to be long range Russian airplanes. When the exercise was over, some of the ships went to Hong Kong for three or four days so that the crews could enjoy a little vacation after working shifts of 4 hours on, four hours off for ten consecutive days. However, I couldn't go ashore to do Xmas shopping or eat delicious meals. I had been in Hong Kong before and being a peasant, I had counted all of the entrees on the menu at our small inexpensive restaurant. Guess how many – 189 different choices.

A friend and I had to stay aboard analyzing the exercise and developing a report for the Admiral on what went well and what did not go so well. Then we suggested several changes to their usual procedures which we felt would improve their performance in detecting the enemy submarines and attaching bomber aircraft.

We had promised the Admiral that we would finish our report before we left the ship and flew back to Japan, hoping to get home for Christmas.

Of course everything took longer for us to do – analyze the results of the exercise, write the draft of the report, get down on our knees and beg the Admiral's yeoman (his secretary,

actually) to type up our report and then deliver it to the Admiral. I am glad to report that we could answer all of his questions and were delighted that he liked the report. He then thanked us and we said goodbye.

It was the day before Xmas. I was in Hong Kong, 2,000 miles from Kamakura, where Ellen was roasting a turkey for a Xmas event treat for three of the intelligence officers – all ensigns with whom I worked in the cave. They all had the duty on Xmas day so that their bosses who were married with children all took Xmas off to be with their families. This is why Ellen was helping them sort of celebrate Xmas a day early. I had hoped to be there but had been delayed by the report writing event. Also, it was a little difficult finding a US Air Force cargo plane flying from Hong Kong to Japan to persuade them to let us hitchhike a ride.

Eventually, we got to a Naval Air Base called Atsugi, near Yokohama, where I was able to get on an Air Force bus to the train station in Yokohama, take the train to Kamakura, then a taxi to our home. It was about 11 pm on Xmas eve. Ellen's three guests had already departed as they had to be back on the Yokosuka naval base before midnight to report in for their intelligence shift in the command cave.

I had seen Charlie Chaplin in a movie years ago when he was on his way up to the Yukon to the gold fields. He was trapped by a blizzard and all they had to eat were boots. He boiled the boots and the boots were on a platter with the nails sticking up. Ellen had roasted a turkey and my three former friends were so overcome at eating a home cooked meal that the turkey sat there on a platter with bare bones looking just like Charlie Chaplin's boots. She cooked another small turkey for us on Christmas day.

Quakers in Tokyo

One of the young Intelligence officers was a Quaker from Philadelphia. He invited Ellen and me to go by train to Tokyo to attend the Friends (Quaker) Meeting. Elizabeth Scattergood, a Quaker woman from Philadelphia, had been hired to teach the Japanese Emperor's son how to speak English and there

were about a dozen Japanese at the meeting. A Quaker businessman would write out a brief abstract of what a Japanese attendee had said and would pass it around to those of us who didn't understand Japanese. I was impressed by the Quakers. They believed that every individual should contact God directly. The movement had started in England about 1650 when George Fox started protesting that the Church of England was doing everything wrong. He felt that there were too many distractions: a preacher who told you how to behave, a special church building with a steeple, an organ, a choir to sing hymns. Quaker could meet anywhere not just on Sunday at 11 a.m., no preacher, no choir, just sitting in silence each person communicating with God with no intermediary. Early Quakers were put in prison frequently.

Since my father was a soldier, I had lived on Army posts all my life until I left home to go to college. Each post had a chapel with Protestant, Catholic and Jewish services. I was a Lutheran at one post and a High Episcopal at Fortress Monroe Virginia where I studied and was confirmed at age twelve.

In Honolulu, I went to Sunday school then the church service in the Lutheran Chapel at Fort Kamehameha. Late afternoon we drove into Honolulu to attend the YMCA's evensong service which offered free supper afterwards.

Friends Meeting of Washington

When Ellen, Jennifer and I returned from Japan, we attended the Friends Meeting of Washington on Florida Avenue N.W. which had been built about 1930 for President Herbert Hoover, a Quaker. We attended for almost four years but didn't join. There was a Peace Center renting space at the Meeting House and most Quakers are pacifists. Finally one of the members of the meeting invited us to join. The procedure was for a delegation of two members to call at our home to discuss Quakers and did we really want to join the meeting. When the delegation arrived I blurted out "I am a Colonel in the US Air Force Reserve. I would like to be a pacifist but I don't think it is possible or feasible in a world with people

such as Hitler." They said, "We understand your position and would like to welcome you as members.

We met a number of interesting people through the meeting, such as Jenny Mustapha, who appeared black but was actually half Turkish (her father was a Turkish sailor that jumped ship to marry her black mother), and the Mikesell family. Alfred Mikesell was an astronomer at the National Naval Observatory near the British Embassy on Massachusetts Avenue. He and his wife Mary had eight children – three sets of twins and two "singles," three boys and five girls. It was unusual in those days for so many twins in one family occurring naturally so they were the subject of numerous studies. The youngest, Steve and John, were Jennifer's age but got along well with Jonathan and Andrew. A Sunday ritual evolved of Jennifer, Jonathan, and Andrew going home with the Mikesells after meeting and Ellen and I came over late afternoon, to eat a waffle supper before taking the kids home. With so many kids, Mary had given up on maintaining high standards of housekeeping. Jennifer loved browsing in books that were in piles all over the house and talking with the daughters as the equivalent of big sisters. Jonathan enjoyed the freedom to do experiments in the "chemistry lab," dig life-size foxholes in the backyard for games, paint the tree house, pour molten lead into bullet molds, etc. with no harassment about cleaning up or staying off of fine furniture.

Returning to the United States

One of the intelligence officers from the Christmas dinner story, Donald Pritzger, had given us a package to take to his mother in Chicago on our way back to the states. When Ellen, Jennifer and I returned from Japan, we went by train to Chicago. When we arrived in Chicago, we telephoned the Pritzgers and they invited us to have lunch with them. We had heard stories that Donald's father was a millionaire. We were surprised when they ordered one sandwich for two of them at lunch and then divided it in half. When Don finished his four years of Naval ROTC commitment, he went to law school and then to business school. Then his father gave him

two hotels in Los Angeles – Hyatt Houses. He built a series of 34 hotels before he dropped dead from a heart attack playing tennis at the opening of a new hotel in Maui, Hawaii. His daughter, Penny Pritzger, is a billionaire who was Barack Obama's fundraising chief for his election. She is now in charge of twenty Classic Residences by Hyatt – retirement places scattered around the States.

We had rented our Bethesda house to a diplomatic family because the embassy always pays the rent. We moved back in and Ellen produced Jonathan Coile at Bethesda's Suburban Hospital with Dr. Norton again charging $100 (same as for Jennifer three years earlier). I worked for a year at the Marine Corps headquarters in Arlington, Virginia.

Newport, Rhode Island

Then we were sent to Newport, Rhode Island where I was one of six civilians attending the Naval War College. There was one person form the National Security Agency, one from the Office of Naval Intelligence, one from the Central Intelligence Agency and two from the State Department. During the War Games, our little group of civilians would play the roles of the President, the Secretary of State, and the Secretary of Defense, etc.

We rented the three-bedroom servants quarters of "The Waves" a mansion on the water where one could see the American Cup races. We had the famous Cliff Walk in our backyard. Jennifer was four and Jonathan was a baby. Because of the isolated although scenic location, there were no other children around so Ellen drove Jennifer around to other activities where she could play with other children. She took ballet lessons and they had a big recital. It looked to me like the only "ballet" she learned to do was skip in a big circle. We joked for years that we had paid hundreds of dollars for her to learn to skip.

Jennifer also went to a nursery school at Fort Adams that was run by Brenda Burgess, wife of Bob Burgess. They were both from Guernsey in the British Islands and Bob was the Superintendent of the Auchincloss farm because of his

expertise in Golden Guernsey cows. The farm was owned by Jackie Kennedy's stepfather and we were visiting Bob and Brenda once when Jackie stopped by and chatted with all of us.

There were about 20 foreign officers from various countries attending the US Naval War College. A German submarine commander, a Dutch Naval Commander who would not speak to the German because his cruisers had been torpedoed and sunk fifteen years earlier during WW II, a Pakistani Commander Mohamed Anwar with wife, two sons and two daughters, a Norwegian, a British officer, an Australian officer, etc. Ellen and I invited the Pakistanis to come to Bethesda to be our guests for a week so their children could visit the Smithsonian, see the Capitol and the White House. About three years later, Mohamed Anwar was promoted to Captain and sent to Washington to be the Naval Attaché. He would invite us to come from Norfolk to Washington to stay for a weekend and go to his Embassy parties. I helped him enroll one of his sons in the University of Pennsylvania.

We were sent to Norfolk, Virginia for a year. I was on the staff of Admiral Gerald Wright, Commander in Chief of the Atlantic Fleet. I was given office space in the Operations Division. I was aboard an aircraft carrier enroute to the Norwegian Sea for a NATO exercise. I was away when Ellen had to cope with a strong hurricane. We rented a house in Virginia Beach two blocks from the beach. We especially enjoyed the summer when my nephew Nessly came to stay with us and got a local job.

We were active in the local Friends Meeting. As much as we believe in public schools, they were so awful that we sent Jennifer to the elementary school operated by the Friends meeting. We were close to the North Carolina border and it felt like we were in the deep south – there were two entrances to the City's hospital, marked for whites and for colored. A receptionist sat in the middle of the two segregated waiting rooms facing the White waiting room, and more than once

Ellen told her to turn around and wait on the poor sick black person in the Colored waiting room.

Race Relations, 1959

The OEG Director sent me to London in 1959 to attend a conference on NATO operations research. When I was to return to Washington I went to Heathrow, the London airport to check in and board my airplane. Just before takeoff, the pilot made an announcement that because of some runway construction project we would take off without our fuel tanks being full. Then, he added, we will make a refueling stop in Shannon Ireland to refuel before we cross the Atlantic. All passengers will debark while we refuel. During this time you will have a chance to buy some wool sweaters in the famous Shannon Airport Gift Shop.

There were no pre-assigned seats when I got aboard the aircraft in London. I deliberately sat down in the last row of seats because I had read too many reports of airplane crashes in Aviation Week where the only survivors were the flight attendants and the passengers sitting in the last two rows in the rear of the aircraft. I sat next to a window and on the other side of the aisle next to the window was the blackest man I had ever seen.

When we landed in Shannon, all of the passengers sitting ahead of us got off. I said "Let's go look at the sweaters. I can't afford to buy anything but we have to get off while they refuel." We each had a cup of coffee and my new friend explained that he was from Uganda and lived on the upper reaches of the Nile. He spoke excellent English because he had been a student at a school run by English missionaries. His African name was Oreaum Obeda but he was known as Kenneth Obeda. He was being sent by the Uganda Government to a week long international conference at the U.S. State Dept in Washington on "Fisheries." Then he was being sent to the University of Washington in Seattle to study fisheries for a year.

I asked him where he was going to stay in Washington while he attended the State Dept conference. He told me that

the U.S. Embassy in Uganda had made arrangements for someone to meet his plane when it arrived and take him to a hotel. I thought to myself that that was a good idea because no hotel in Washington would let a colored person stay in their hotel.

When we arrived in Washington after midnight because we were late because of the refueling stop in Ireland, there was no State Dept rep to meet him and take him to a hotel. I said, "Why don't you come home with me just for tonight? I live in Bethesda seven miles away and I drive right by the State Department on my way to the Pentagon each morning. The next morning I delivered him to his conference. Later that afternoon I telephoned him to see if the State Department had made suitable hotel arrangements. He explained that they had made these arrangements, but there was a slight problem. The Uganda folks had given him money for travel and hotel expenses but he didn't have enough for this fancy hotel. I said "Well why don't you stay at our house until you fly to Seattle." We had a delightful time showing him some of Washington's tourist attractions. We took the elevator up to the top of the 555 foot Washington Monument but he carried Jonathan who was two years old all the way down from the top. Incidentally, he was asked to give a broadcast in both English and Acholi on the Voice of America radio station. When he was recording his broadcast, the announcer who was asking him questions about his impression of America, stopped the tape in disbelief. Did I hear you correctly – did you say you think Americans are very friendly because some stranger on the airplane invited you to stay as a guest in his home for a week just because you came from Uganda?"

He told us that his father was the Chief of the Acholi tribe in Uganda, and gave us a present of a bird carved out of a water buffalo's horn. We still have his present 50 years later. We read that some years later he was appointed Minister of Fisheries on the Upper Nile, but was assassinated by Idi Amin who killed many Acholis.

OEG Exercises

There was a big NATO exercise in the Norwegian Sea in 1960. I went on the aircraft carrier USS Shangri La in my role as chief of the operations analysis of the exercise. My Admiral had an unusual tactic to avoid the (pretend) attacks by the Soviet Air Force (the Royal Air Force Bomber Command pretended to be Soviet aircraft). The Fleet commander broke up his force from one large easy-to-find battle group into many small task forces. Each task force had one high value unit such as an aircraft carrier, a cruiser, or a tanker, steaming in formation with two of our destroyers. These small task forces were then scattered all over the Norwegian Sea. Our carriers launched bombers who pretended to bomb Russian cities (simulated by cities in Scotland). For 72-hours, our carrier based bombers pretended to drop atomic bombs on the targets while the Royal Air Force searched all over the Norwegian Sea, attacking the wrong task forces while they tried to find the needle in the haystack, the aircraft carriers launching the bombers. I was in charge of reconstructing the results of the exercise on the ten-day return voyage to Norfolk. The NATO Navy beat the ground based attack aircraft simulating the Soviet threat.

Marine Corps 50-mile March

My next OEG assignment was to set up a four-man detachment at Quantico, Virginia at the US Marine Corps Landing Force Development Center. I was by myself when I first went to Quantico. We helped design tests of a new M-16 rifle system and I helped conduct tactical war games.

General Lewis W. Walt was the Assistant Division Commander of the 2nd Marine Division at Camp Lejune, North Carolina when he was given orders to come to Quantico to take over the Landing Force Development Center. He was the first to say that he knew nothing about research and development but there was a Marine Battalion on paper under his command that would stand up in war time. He announced that all Marines in his command would hike for four hours every month, just like the aviators who flew four hours a month to keep their flight status.

The General decided that the entire Landing Force Development Center personnel, including aviators, would go on a 50-mile march. I was the only civilian on staff, and so this didn't technically apply to me. The Battalion was to depart at 0600 and march for 25-miles to the Basic School where we would have a steak lunch, and then march back.

To prepare for this, General Walt scheduled four weekly ten-mile marches. I asked the OEG Director for permission to participate in these work-up hikes and the long march. Permission denied. He wanted me doing research and not pretending to be a Marine.

The Marine Aviators disregarded this order, thinking it only applied to infantry types and not them. They skipped the conditioning hikes but when the day came for the big march, they were ordered to go. The Sergeant Major checked off a roster to make sure everybody marched.

I didn't get to go on the conditioning hikes but when the big day came, I took a day's leave to participate. It was a hot day in August but the constant rain helped to cool us down a little. The troops had been told to bring their spare dry socks in their pack, and I had two pairs with me. When we had marched about ten miles, the order came down to halt for a ten minute rest and put on dry socks. When I pulled my feet from my boots, steam rose into the air.

The terrain at Quantico on the 25-miles route to Basic School was hilly. There were medics along to tend to blisters, and an ambulance to pick up anyone who fell by the wayside. I tried to stay about four people behind the General, who led the hike. We had a hearty steak lunch at Basic School and then marched the 25-miles back to base.

At the end of the hike I went back to my office and worked for an hour. Then I got in my TR-3 and drove two hours home. When I got home I could barely get up the four steps near the front gate. Ellen saw me barely able to walk and helped me up the six steps to the front door. She then ran a warm bath and told me to get in it. After a healing soak, she tucked me into bed and I slept like a log, around the clock.

The General held me up as an example to all the Marines who had ducked out of the hike and scheduled a mandatory make up. My reason for making the march had been to bond with the Marines so they would accept me as one of their own. By completing the hike I had really earned the respect of the Marines so it was all worth it.

I was at Quantico for three years and then we moved to Marine Corps Headquarters for three years.

Gliding

One day Elihu Root telephoned me and told me that he was going to Elmira, New York to take flying lessons to fly a glider. He already had a pilot's license for Cessna 152 type powered aircraft. He had received an ad that said: "Learn to Fly a Glider in Ten Easy Lessons $250, come to Schweitzer Sailplanes, Elmira, New York."

It sounded great to me so Ellen and I drove with the children to Elmira. We stayed in a motel as did Hu, Molly and their children David, Caroline and Alice. I only had a week's vacation so I took half of the lessons that first summer. I soloed on the last day. The following summer both families went back to Elmira and I finished taking all the required instruction, took a written exam and passed a check ride exam with a certified FAA inspector, with flying colors. A thunderstorm suddenly started up and the inspector said to me "Land at once!" I had been given fantastic instruction so I knew how to increase my air speed, crabbing into a forward slip on final to minimize drift while increasing my descent rate. I landed on the runway, and once on the ground coasted over towards some people near the runway who could hold the plane down so it wouldn't get blown away in the heavy gusts from the edge of the storm.

For the next two or three years I did about 100 hours of soaring with the MidAtlantic Soaring Society. The Club members lived in Virginia, Maryland and Pennsylvania. The Club owned a Piper Cub tow plane and a Schweitzer 2-26 and an old World War II training glider with fabric covered wings. A similar one held the American altitude record for two place

gliders by climbing to 40,000 feet. Every weekend with good weather we would gather at an airport such as Westminster, Maryland or Frederick, Maryland or Leesburg, Virginia. I stayed up three hours and 23 minutes at Leesburg, my longest duration flight. I couldn't quite hang on for the five hours required for a "Silver C" rating. I did get the altitude increase of 1,000 feet flying at Tehachapi in California.

England Trip, 1963

When I proposed to Ellen I was up front about my finances and everything else. But being a simple soul, some of the implications didn't register.

For instance, my first marriage had left me with debts which amounted to three quarters of a year's salary.

Although Ellen came from modest (read poor) beginnings, they adhered to the admonition "neither a borrower nor a lender be" so she came with modest savings and no debts. Being in debt was not an option for her, and as she was coming out of British wartime conditions, she was used to doing with very little. She was determined to get us out of debt, not easy as half my income went to support the three children of my first marriage. She worked, and everything she earned went to debt reduction.

There was no question in her mind of taking out a loan, so it was eleven years before we took a trip to England so she could see her family. This was only possible because I was going to Paris to give a paper at an international conference.

My father secretly (from my mother) gave me the money for Ellen and the children. In those days, if you bought a ticket to your furthest destination you could make as many stops en route, for as long as you wanted, as long as you kept going forward. So I booked tickets to Stockholm, Sweden. As Andrew was under two when we started the trip, his round trip fare was $58, 10% of the adult fare and other children were half price.

So, we started out in England. My sister-in-law's house was small for an extra five virtual strangers, so we decided to go to a typical English summer holiday by the sea and

booked at a boarding house in Swanage on the south coast. This worked fine. We took the train from Waterloo Station. It gave the cousins a chance to get to know each other and wasn't a strain on anyone. The only thing we hadn't counted on—the weather. It poured every day. This didn't bother us; we took bus tours. The driver giving the tour would say "On a clear day you can see to the Isle of Wight" while we couldn't even see across the street. Some of the other guests gave up on Wednesday and went home, but we told them that if we wanted hot weather with bright sunshine, we would have stayed home. Jonathan and Jennifer enjoyed English comics that were printed in weekly magazines rather than in strips in the newspapers.

In an English boarding house you are supposed to disappear after breakfast and come back in time for the evening meal. We found things to do, like the bus trips for instance, or a tour of Poole Pottery, and it didn't actually rain all the time. The children were able to experience Punch and Judy shows on the beach, which was a new experience for them. Being in Devon meant we could have "cream teas," with Devonshire clotted cream.

We left Swanage and went to my sister and brother-in-law's, Violet and Dick Goode and their daughter Dianne in Barking, Essex, a suburb of London on the Underground system. It was easy to get up to town to visit places like the Tower of London, etc. either by "tube" or bus. The bus took longer but was more interesting.

From there we started our European experience. We flew to Paris where I gave a paper on June 28, 1963. "Educational Planning in Developing Countries" at the *Societe Francaise de Recherche Operationelle* Symposium in the same room where later the north and south Vietnamese negotiated the Paris Peace Talks. We then flew to Copenhagen where we stayed in a temperance hotel that had been recommended to us by Ellen's best friend, Doreen. It was perfect for our family. We were able to visit Tivoli—the famous amusement park that pre-dates Disneyland by over a century. The main attraction

for us was the flea circus, where fleas actually performed acrobatic tricks under large magnifying glasses.

Next on to Oslo where I was an American delegate at the International Conference on Operational Research. We took a trip along a fjord with conference delegates, and I was able to meet with my Norwegian relatives on my mother's side. We enjoyed the statues in Frogner Park. We were taken to see the Holmenkollen ski jump used in the Olympics. My cousin's husband, Johannes, was president of the organization that owned the jump. Our son, Jonathan, asked, "Is he really a King?" because he thought we were saying "your highness" when we spoke to him.

We then went to Stockholm, to see where my grandmother on my mother's side came from. We were able to go to the Friends Meeting, which was nice. Silence is silence in any language and someone will always tell you if something momentous has been said. After meeting, a young man offered to take us hiking after lunch. This was the kids' first taste of wild blueberries.

From Stockholm we retraced out steps, back to London. After a few days, I received a cablegram saying my father had had a stroke and was in the hospital. We immediately made arrangements to fly home to be with him and help my mother.

We had rented out our house in Bethesda to help pay for the trip, so I had to leave Ellen and the children in Hampton while I went back to Washington to work returning for the weekends. My father died five days after we got home. He was 86 years old.

Marine Corps Operations Analysis Group, 1961-1968

When I was the director of Marine Corps Operations Analysis Group (MCOAG), I was able to hire some first class people. We were stationed at Quantico Marine Base – out in the boonies of Virginia beyond the Washington metropolitan area. I was having a hard time finding a secretary when Ellen suggested I advertise in the base newspaper because maybe a Marine wife would want the job. Bingo! I hired a Marine wife,

Patricia Hill, who was very clever. She soon became more than a secretary, she was my administrative assistant, without the name or pay. I was told I had to hire an administrative assistant and said, "fine, Pat Hill is doing the job, it should be hers." I was told that I had to hire a man for the job, a woman couldn't do it. But Pat was already doing it. I insisted and they finally agreed.

Pat was working full time for me, going to classes to finish a degree and keeping house for her husband and young son. Then she got pregnant. Talk about multi-tasking! We just didn't have that phrase then. She did all her tasks magnificently.

I also hired the grandson of a friend of ours. His father was a Navy pilot killed in World War II. He was given an appointment to the Naval Academy but really didn't want to be there, so he failed physics on purpose. The authorities knew it was "on purpose" because his grandfather Albert Michelson was the first Naval officer to earn a Nobel prize – in physics – for measuring the speed of light.

Jeremy Foster left the Naval Academy and went to Antioch College, which was much more to his liking. He breezed through and was job hunting when I met up with him. I knew his mother and I hired his sister, Baba Foster, who worked with me on several projects and we published papers together.

Jeremy met a wonderful girl at Antioch, Alice Gerrard, and married her. She was classically trained in music but got interested in bluegrass and teamed up to perform with Hazel Dickens.

Jeremy was riding to work at Quantico with another MCOAG analyst who crashed into another car. He was killed instantly. It was a real tragedy. He and Alice had four children and his life had hardly begun. After a rocky youth he had finally found himself. He was brilliant and I was expecting great things from him.

We were able to arrange a memorial service for him in the Friends Meeting House. The place was packed. After the service we had the family and close friends come to our house.

They sat around and sang his favorite songs. Mike Seeger, Pete's younger brother, was a close friend so he sort of led the singing. It was all very moving.

Alice received some money from the driver's insurance company so she was able to put a down payment on a house. We sometimes saw her and Hazel in concert and kept in touch for many years.

One of the things I wanted to achieve as director of MCOAG was to have people be friends as well as colleagues. I did this by having frequent fun events. We had picnics with all the kids, and dinners at our house in Bethesda.

Ellen was game and we had dinner parties for 50+ people. She did all the cooking and decorating herself. We frequently included not just the civilians but the Marines we worked with. We did not serve alcohol. After one such dinner, a Marine officer approached me on the Monday to thank me for a great party. He said he woke up Sunday feeling great – no hangover. I assured him it was because we hadn't served alcohol. He couldn't believe it. He was sure the tomato bisque soup served in mugs as people arrived had been "laced" but it hadn't. It was winter and the warm glow came from the hot liquid on a cold night and the friendly company.

When General Walt for whom I worked was being shipped to Vietnam we decided to have a farewell dinner for him. There were 50 people at a sit down dinner in our family room, 20 by 24 feet that we had added on to our ranch house. Ellen had grapefruit to start; then roast beef, mashed potatoes, gravy, vegetables and a sheet cake bought from the Pentagon bakery, suitably decorated.

Ellen kept trying to get General Walt, as the honored guest, to go first in line (we served buffet style but sat at a table to eat). He refused saying he wanted everyone else to go first. What she didn't know was that the commander always eats last, after he is sure that all the troops have been fed. In all her years of entertaining, Ellen has never run out of food. After eleven years of food rationing and food shortages during and after WWII she never underestimated

the amount of food needed and we never minded having "planned overs."

We had a baby shower for my administrative assistant, Pat Hill. She was in an automobile accident on the way to our house. She was taken by ambulance to Walter Reed Army Hospital as her husband was a Marine. She wanted to go to Bethesda Naval Hospital, which was closer to the crash site and to our house, but they had the final say so, so Walter Reed it was. She was checked out and both she and the baby were ok so she came to the house. The party was over, but we gave her a meal anyway, and all the baby gifts.

Pierre Tullier's Wedding Reception

When Pierre Tullier, one of my analysts, announced he was getting married, everyone said, "Great, a party." MCOAG was always up for a party, but Pierre quickly shot down our balloon – no party. The bride's mother didn't approve of the marriage because Pierre was Catholic and they were Protestant, so no reception.

When I told Ellen she said, "That's ridiculous. We have to have a party. We'll have it at our house."

We had the couple to dinner to discuss details. When Ellen first came to America we were invited to a wedding. After the ceremony in the church, there was cake and punch in the church basement. She was thinking along those lines, with a few embellishments for, say, fifty people.

The wedding was to be in downtown Washington at 11:00 a.m., which meant people would arrive at our house at 12:30 or so which also meant people would be expecting lunch. So Ellen decided on chicken salad, lettuce salad, rolls and butter. She told the couple they should provide the cake. She would have champagne punch and a non-alcoholic punch, plus coffee. Some people just don't think a meal is complete without coffee.

Ellen asked our teenage daughter, Jennifer, if she would like to be a serving wench and maybe recruit a couple of friends to help. The girls thought it would be fun, so Ellen

sewed long matching caftans in blue and green flowered print for them and agreed they could go barefoot.

Ellen worked for days before hand to get everything ready as a professional caterer would – cooking the chickens and striping off the meat for the chicken salad for one hundred was the most time-consuming. These days people would probably just buy it from Costco.

Pierre and Sharon wanted Japanese flower arrangements on the altar, and as Ellen studied Ikebana when we lived in Japan she agreed to do them.

She also pegged a white sheet to the driveway with a sign "Reserved for Mr. and Mrs. Pierre Tullier," to be sure there would be a place for them to park when they got to the house from the church.

The "serving wenches" made it all happen. They kept the punch bowls full, replenished the chicken and lettuce salad bowls, and collected the dirty dishes. They passed around the cake after it was cut and looked cute while doing it.

After everyone left, the bride's parents sat down with us in the family room. Sharon's Dad thanked us for putting on the reception and said he would like to pay for it. I said that wouldn't be necessary, I was glad to do it, but he insisted. Ellen had kept a list of money spent, which she did for big parties, just for information, for future reference. She gave the total, which was small for so many guests. Sharon's mother read the list and when she saw champagne listed (for the punch) she said "We aren't paying for that!" Her husband told her to hush up and got out his check book. The mother had told Sharon she wouldn't give her a wedding reception but when she found there was going be one, she invited two of her best friend couples, and now she was objecting to paying for it after offering to. Ellen smoothed things over, so having the reception not only gave the young couple a proper start to their marriage, it started the healing process between mother and daughter, so all of the hard work was worthwhile.

An Accident, 1966

When our children were little, we didn't go out much, with limited funds for paying for sitters. But we always went to what Ellen called "command performances" – events organized by my commanding officer, with a price tag for not going.

When Andrew, our youngest, was five years old, we were at one such cocktail party. Jennifer was a very mature 12 so we left her to baby-sit. We were walking up the front walk to the house when someone said, "there's a phone call for you." It was our neighbor, Bill Caroll, who said a glass shower door had broken (it was supposed to be shatterproof) and had cut Andrew in the leg. We raced home, just as the ambulance got there, and then rushed with Andrew to the hospital. Jennifer had run over to ask Bill next door to come over since he was a retired Navy medic, who knew what to do about heavy bleeding, then she called the Rescue Squad.

Andrew had lost a lot of blood as he severed a main artery. The doctor came out and told us it was "touch and go" whether he would live, and if he did, he would probably be in a wheelchair for the rest of his life.

I sat with Ellen and we prayed a lot. He was in surgery for five hours, which startled us because Christian Barnard has just done the first heart transplant operation which took six hours. Andrew was in the hospital for a month, with his leg in a cast for many more months. He was on a lot of prayer lists, besides Quakers. Our Catholic neighbors the Brannigans made sure the entire Our Lady of Lourdes School and parish prayed for him.

I think Andrew has nine lives, like a cat, because soon after his recovery we were on a camping trip to New England when he walked into a mud wasp's nest and was stung numerous times. He swelled up rock hard and we rushed to the Gloucester emergency room. He turned out to be allergic to wasp stings and it almost killed him. For years after, he was not allowed out of the house unaccompanied and his keeper had to carry a kit with baking soda (to neutralize the

acid in the sting) and a hypodermic with antihistamine to be administered as soon as possible. For years he had to get shots; they started out every day, decreasing to once a week, then monthly, for about 12 years. He survived this too.

World's Fair, 1967

We drove from Maryland to Montreal with our camping trailer to spend a week at Expo 67, an international exhibition occupying an island in the middle of the St. Lawrence Seaway. The Expo was appealing because we had a lot of fun at the New York World's Fair in 1964.

We traveled from our campground to the island every day by public transportation, crowded with everyone else headed to the same destination. We flashed our Expo Passports to enter the Expo and got them stamped at each country's pavilion as we visited. The kids were excited to meet people from places they had never heard of – Mauritius being one – and try new foods – Belgian waffles.

At breakfast on Thursday, I announced: "Today is Coile Family Transportation Day at Expo '67 – we're going to see how many different kinds of transportation we can experience in one day…" and we counted them off as the hours rolled by.

#1: From the campground, a commuter bus, lead to…

#2: A monorail to the island, then

#3: Peoplemover at entrance

#4: Pedicab – sturdy college students pedaled us for a loop in crowds almost as thick as Hong Kong's

#5: Skytrain/ski lift ride that took us from one end of the island to the other

#6: Elephant ride in the African section, which contrasted sharply with

#7: Camel ride. Andrew, at six, was the most alarmed about the process for reaching the ground at the end of these rides.

#8: The British had brought a hovercraft to show off their new technology. Since Ellen was very sensitive to seasickness, she was resistant about going for a ride and didn't believe

the claims that we could zoom over the very visible rapids in the St. Lawrence River while maintaining the craft completely level.

#9: A helicopter ride. I didn't go because I got so many rides from working with the Marines, but the kids were thrilled.

#10: We went camping at Mount Desert Island in Maine for a week on our way home from Montreal. I arranged for the children to take a flight in a seaplane which was based on a nearby lake.

Quaker Bazaar

We looked forward to the annual Bazaar at the meeting, especially the book section. It seemed like each year, we were busy buying back books we had donated that the Mikesells bought the previous year and they were busy buying back books that they donated and we had bought. The Bazaar raised money for Quaker causes and besides Books, had sections like White Elephants, Baked Goods, Handicrafts, and Plants. One year they said there would be no Bazaar because there was no one to serve as Chairman. I finally volunteered because I knew there really wasn't much to the job, just let the committee chairs run their section like they always did.

International Student House

For some unknown reason, the Bazaar raised an unusually large amount of money that year. The meeting for business decided to give a large donation to the International Student House at 1825 R Street N.W. Some wealthy people in Washington had bought an old hotel and made it into a residence of students from Argentina, Tunisia, Siam, Burma, and all over the world who were students at Georgetown or George Washington Universities. This House was modeled after the famous International Student House in New York City which has 700 residents from 100 different countries to encourage cultural interchanges.

I was invited to be a member of the Board of Directors. It was an interesting experience for a peasant like me to see how really wealthy people lived. When I attended a board meeting

in one of the members' homes I always enjoyed going where a colored housemaid in uniform would open the front door to let me in and then bring me a cup of tea!

Quakers have no paid clergy and everything is run by committees of the members. There is almost no escaping serving on at least one committee each year. I enjoyed my stint on the Library Committee.

We noticed there were a number of Meeting families with young children near our home in Bethesda. Somehow Ellen started a worship group in our living room, which evolved into the Bethesda meeting, separate from the Friends Meeting of Washington on Florida Avenue. Literally just around the corner from us lived Jesse and Grace Yaukey; Grace was the sister of Pearl Buck and wrote children's books under the pseudonym Cornelia Spencer, including some stories of her childhood in China with Pearl.

Vietnam, 1968

Our Marine Corps Operations Analysis Group (MCOAG) provided useful support to the US Marine Corps. Initial tests of the AR-15 (later called M-16) were disappointing from a reliability standpoint. Unless you cleaned it thoroughly every few hours, the smallest bit of dust or mud would cause a malfunction and jam. The Marines decided to test the "Stoner" system which was an improved rifle and light machine gun developed by Eugene Stoner who had developed the AR-15. The newer Stoner was very reliable. General Walt tried unsuccessfully to get the Army to test it. He invited me to accompany him on a trip to Fort Benning, Georgia and other Army posts. However the Department of the Army rejected the whole Stoner idea because they were supplying the South Vietnamese Army of smaller soldiers with M-16s.

I had sent out one of my analysts to Vietnam at six month intervals to collect data on USMC operations. My General wouldn't let me go. However, he finally said I could go for a month. I flew to Danang and reported to General Anderson who was in charge of Marines in Vietnam. His aide gave me an engraved invitation for dinner that evening that said

"Dress – Utilities." I was authorized to wear USMC uniforms for protective camouflage so that I would not be shot by a Viet Cong sniper. Ellen had made some cookies for the General and packed them in a tin for him. The other guest that night was an Army General who was in charge of a project of detecting movement on the Ho Chi Minh Trail of supplies being carried by men, bicycles, and elephants down from North Vietnam to South Vietnam. I brought home a captured Viet Cong basket that was filled with VC uniforms of black pajamas, that Jennifer still uses as a laundry basket.

I went up to Dong Ha where the Third Marine Division had its headquarters just south of the Demilitarized Zone. Major General Ray Davis treated me as his guest and for the first week took me each day with him in his helicopter all day long. There was a morning operations and intelligence brief after breakfast each morning. Army General Stilwell who was Corps commander would send over an Army helicopter with more powerful engines each morning, because the previous Marine General in command of the Third Marine Division was in an accident because the Marine helicopter didn't have enough power to lift off properly in the heat and crashed. The Marine general broke his back. Therefore General Stilwell would lend an Army helicopter to General Davis every morning. General Davis had an aide who was really his bodyguard, and the division Sergeant Major went with him so that he could talk to all of the enlisted Marines and see if they had any problems or anything that the Sergeant Major should bring to the General's attention. The General would visit each of the three regiments and have a brief briefing by the regimental commander. Then he would go to each of the three battalions in each of the three regiments where the Lt. Col. in charge of the battalion would tell them what happened in the previous 24 hours. Then the General would visit any isolated units such as those over near the Laotian border so that he personally kept in touch with everything that was going on to see what he might do to help them carry out their particular mission. Also the General would go to the

field hospital every day to talk to the wounded. The General would go to all the funeral services scheduled almost every day. These were very dramatic with a chaplain besides the dead Marine's rifle stuck on its bayonet into the sand besides the Marine's boots.

I was there for three weeks working basically in the command bunker which was a hole in the ground about 15 feet deep covered with tree trunks and then with maybe three or four feet of dirt on top of the flat roof so that it was supposed to be relatively safe from artillery fire from North Vietnamese army units. I would normally quit microfilming about four o'clock and go and take a shower and put on some clean utilities which the Vietnamese laundry women had been beating on the rocks in the river to clean them.

On one particular day I was not quite through with my microfilming and so I planned to leave the bunker about five o'clock. This was fortunate for me, because the North Vietnamese long-range artillery about 10 miles away fired a few artillery rounds of perhaps 152 mm big guns while I was still in the bunker. All of the hooches (tents with a wooden floor and cots) had a trench beside them. In the middle of the night if there were some noise of incoming rounds, we would have to roll out of bed and jump into this trench (which might have a foot of water in the bottom) The Sergeant Major had gone into his trench. After a couple minutes he had stuck his head up to see what damage had been done. Just then two more rounds landed a few feet away and shrapnel from one round hit his head killing him instantly.

We all waited for 15 more minutes after the shelling stopped until the "all clear" bugle sounded. The general's mess hall where we ate an hour or so later was considerably damaged, with holes in the walls and with the cooks all bandaged up because of their shrapnel wounds.

After leaving Vietnam, I stopped in Hong Kong for some Christmas shopping. The prices there were very low at the time compared to anywhere else in the world. I brought back a Siberian wild mink jacket for Ellen, watches and opera

glasses for Jennifer, articulate fish ornaments in sterling silver and a very shiny gold cocktail dress for Ellen. I had seen it in the window of a shop and asked a shop girl who was approximately Ellen's size to try it on to guess the size. Ellen later gave it to her niece Dianne, who enjoys sparkly type clothes.

Xmas in Key West, 1968

When I got home from Vietnam in mid-December, I just didn't feel like celebrating Christmas as usual. I discussed it with the family, and we decided to hitch up our Cox folding camper and drive to Key West. I don't know why we chose Key West, except we wanted somewhere warm, away from the Washington winter.

I didn't realize just how far it was. I think we spent more time on the road, going and coming, than we did in Key West. Driving along the causeway was frightening. It was so narrow one had the feeling of driving on the ocean. I have driven it since and it was been so improved you don't get the feeling of a causeway at all. I'm glad I had the experience of the original highway. Anyway, it was a wonderful family time and just what I needed.

We found a nice campground on the water and enjoyed the city. Christmas Day was very low key. We ate in a modest restaurant, more of a diner, actually, as not much was open. We had conch soup and key lime pie, which seemed appropriate.

It was a very relaxing and bonding trip – just what I needed after the rigors of Vietnam.

Patience III, sailing to Norfolk and back

In 1969, I was transferred to Norfolk Naval Base for a year. I drove down and found a house in Virginia Beach with a boat house in the backyard. I signed the lease for a year and then I had to get my 21-foot boat down to Virginia Beach. My crew included Jonathan, Thomas Black, and one of Lloyd and Gladys Swift's sons to sail the 120 miles. Lloyd came just for the first day because he couldn't get more time off work

and arranged for one of his sons to meet us in Reedville and drive him back to Washington. Apparently I miscalculated the wind conditions and the time it would take to cross the fifteen miles of the mouth of the Potomac. In order to reach Reedville, a large commercial fishing port, we had to sail in the dark and didn't arrive until midnight. This upset Lloyd. The trip ended up taking several days. A year later, I sailed Patience back up to Annapolis with just Thomas and myself; we stopped halfway for an overnight stop.

Ellen felt that I had over-emphasized the boathouse feature rather than finding a house suitable for her and the children to live in and was discontented with the house the whole year. We had a lot of visitors, including Ian and Claire from Toronto on their way to Myrtle Beach, South Carolina. One weekend was very unusual – Virginia Beach was the perfect location to observe the solar eclipse, more so than Washington. So our friend Alfred Mikesell, the Quaker astronomer, brought down telescopes and other viewing apparatus to safely watch the eclipse, and Washington friends like the Wigglesworths came down for the weekend. The house was set on three acres, so there was plenty of room for the viewing party, including many local friends. The house was bursting at the seams with houseguests; some people slept on our boat in the backyard, others pitched a tent. Ellen laid on the food for the mob scene.

Seatack in Virginia Beach, 1969-70

Ellen felt that we should help the poor black descendents of slaves living in small houses in a small area called Seatack, surrounded by the most expensive part of Virginia Beach. The local Volunteer Fire Department Chief attended the Virginia Beach Friends Meeting and was well known as the unofficial "mayor" of Seatack, one of twelve traditionally black neighborhoods in the Virginia Beach area, near the Oceana Naval Air Station. Ellen began volunteering at the Head Start program at the Seatack Community Center and started an evening tutoring program. She started to observe other community needs and got me and our friend Thomas

Black involved. It turned out to be very useful that Thomas was the Admiral's yeoman, so when he made a request for assistance, people might have thought it was coming from the Admiral. The Seabees came to Seatack one Saturday with flat bed trucks to haul off rusting junk cars scattered in the front yards.

In the tutoring program, Ellen noticed an eight year old named Cleophus having trouble reading and wondered if he was dyslexic based on the symptoms described in a Reader's Digest article she read. An aviation psychologist from the Naval Air Station brought the educational materials to test him and confirmed that he was dyslexic, then worked with the school to help him get the help he needed. I tutored some teenage boys in math. They wouldn't come on their own for help, but got tricked into it when they had to bring their six or seven year old brothers and sisters.

I'll never forget when Thomas Black introduced himself and asked the ten-year-old he was tutoring "What do you want to call me?" thinking the kid might say Thomas instead of Mr. Black. Instead the young man responded "I want to call you Boy."

To help with housing conditions, I helped built a brick sidewalk, in an elaborate Williamsburg-type pattern, to help an elderly man get to his outhouse without walking in mud.

Sailing, 1968-1982

When I reached the point in gliding that I needed to buy my own aircraft if I were to progress towards proficiency goals, I thought about it and decided to buy a sailboat instead. Although I enjoyed gliding, it wasn't really a family-friendly activity. I took the boys with me and they enjoyed moving the gliders around on the ground, sometimes sitting in the pilot's seat. Ellen would come sometimes, bringing a picnic lunch, but sitting doing nothing bored her to tears. She took one flight and declared she got as big a thrill riding in an elevator. I wasn't going to make a pilot of her, although there were several women pilots in our club.

So the decision was made, I would buy a sailboat. I found a 21-foot English-made sloop. I named the boat Patience III and kept it at the City Marina in Annapolis, Maryland. I would take the children (usually the boys, sometimes Jennifer) for the weekend.

When I was considering buying a boat, Ellen said it was okay with her as long as she didn't have to go. Although the idea of sailing appealed to her, she got seasick standing on the dock, watching us putting the sails up. So her participation was to do the catering, which was a big help to me. Ellen would cater three meals a day, plus snacks, with written menus. She would have dinner ready for us when we arrived home on Sunday.

I had a friend with a boat. He would invite people to go sailing for a weekend. His wife would count how many people were there and then go to the local grocery store for provisions. The bill would be split between the guests. Ellen claimed she was doing her weekly grocery shopping and everyone was paying. She felt that guests are just that, and shouldn't be asked to pay to be there, hence the full catering.

When I was in England I started looking for sailing opportunities. I ended up buying an Atalanta, a perfect boat for someone like me who liked a little gentle sailing – no racing. This boat was designed by Uffa Fox during World War II to be an air-dropped life boat for downed pilots during the Battle of Britain. It had a "How to Sail" instructional manual, and was very stable. It could go in shallow water without running aground. It was exactly the kind of family boat I needed.

Patience, our Fairey Atalanta, hull number 101.

The Atalanta was built by an aircraft company of wood just like the wood construction of airplanes during World War II such as the DeHaviland Mosquito bomber. The airplanes and the sailboat were built of several layers of wood baked in a large oven. It was 26-feet long, had a beam of 7-feet, 9-inches so that it could be towed on a trailer on road which had a legal requirement of less than 8 feet wide. It weighed about 4,000 pounds because of two drop-keels each weighing 475 pounds. It could sail in two feet of water or cross the Atlantic with the 5 feet 9 inches drop keels down. It slept four in two cabins plus quarter berths for two additional people. 186 boats were produced by the Fairey Aircraft factory before fiberglass was adopted for construction of boats.

It was kept at the Fairey Aircraft Co. at Hamble where it was "dry sailed." It was on a trailer. When I wanted to go sailing I would telephone ahead and they would have it in the water ready to go when I got there. When I was through sailing I would tie it up to the pier and they would put it back on the trailer and back on dry land. A perfect set-up.

Again, Ellen would participate by catering the weekend. She would invite the crew to dinner on Friday evening. We would then drive to Hamble, 75-miles away. Sleep, sail all day Saturday and most of Sunday and arrive home in time for another Ellen feast.

Patience at sea off Annapolis in a gale under reefed main and storm jib.

I brought Patience IV back to the States and continued the same routine. I had her moored at the Naval Academy in Annapolis. When I moved to California I checked with the Monterey Harbormaster. He said there was a ten-year wait for a slip. He looked at me and said "Forget it. You won't live that long." That was 26 years ago and I'm still here! Anyway, it seemed like a good time to give up boat ownership. It is very expensive and I reckoned I could charter a boat when the desire arose and still be ahead. It turned out the Naval Post Graduate School had a sailing club and I was eligible for membership. Problem solved thanks to my Air Force Reserve Officer status.

Owning an Atalanta was a bit like being a member of a religious organization. There were only 186 of them built and there was a very tight club. They kept track of all the boats, when they changed hands and where they were. Since 1959 the club held a black-tie dinner in January every year at the time of the London Boat Show. When I got back to Bethesda, I decided with Ellen's help to hold the North American Atalanta Association dinner on the same night as the one in London. We sent them a telegram of greetings that was read out loud. People came from all over America and even Canada for our dinner. Stewart Brand, who started the *Whole Earth Catalog*, came one year, from Sausalito, California, which is famous for keeping wooden boat traditions going. The dinners continued until I was posted to Brazil.

Once an Atalanta owner, always an Atalanta owner, but the years have taken their toll and many owners and even some boats have gone to that great ocean in the sky. Even though I don't own a boat anymore, I'm still a member and the Atalanta Owners Association is going strong with a nice website online.

Naples, Italy, 1971- 1972

In 1971 I was sent to Naples, Italy to be a scientific advisor for COMASWFORSIXTHFLT, the admiral in charge of, the Anti-Submarine Forces of the Sixth Fleet. Jennifer was half-way through her senior year of high school. We considered having her board with a friend of ours for six months, but on serious consideration decided it was better not to split the family up. This meant one of two things; either all of us would go in December, or I would go on my own first and have the rest join me in June. We decided the latter course was better.

It was hard being without the family, but there were compensations. I stayed in a small hotel just outside the U.S. Navy compound. I ate all my meals in the snack bar or officers club on the base. There was a laundry and a base exchange for anything I might need. The hotel and my office on the American Navy base (not far from a NATO base where I also had privileges) was in the crater of an active volcano

and sulfur fumes came out of fissures all the time. I had had breathing problems all my life, but they miraculously cleared up when I was living in the volcano.

I spent a lot of time hunting for a good apartment for us to live in. As a civilian, the Navy did not assign me housing. I had a housing allowance, and they did help me negotiate a lease with the Italian landlord. I'm glad I had so many months for house hunting because I was able to find a spectacular and spacious penthouse with a huge picture window looking out on the Bay of Naples and Vesuvius, just like the postcards. It was a convenient location but on a relatively quiet side street, which is truly hard to find with so many Neapolitans who love to honk their horns. Security was good too, because there was the residence for the General serving as Commander of Allied Forces – Southern Europe for NATO, located just in front of us, with 24/7 police guard by his front door. We were two blocks from a funicular which went down to the Bay of Naples.

The Special Services Department organized trips on weekends, so if I had nothing special to do, I could go to Roccarossa, a Dolomite resort, for skiing. We went on a bus on Friday afternoon, skied on Saturday and Sunday, then took the bus home Sunday afternoon.

We also utilized these services when the rest of the family joined me. We went on the organized ski trip for three weeks, in order for Jonathan and Andrew to take lessons, and after that sometimes we would go on our own for a day trip, using our VW Camper.

Jonathan had joined a scuba diving club. He liked to go on the Saturday dives to such places as Sorrento or Pozzuoli, where he could swim around in Roman ruins. Then on Sunday we would drive to Rocarossa so I could go skiing with my boys. This must be one of the few places in the world where you can go scuba diving one day and skiing the next.

One of the treats of the scuba diving trips was the visit to a pizzeria after the dive. The club members had found a place where you could order pizza by the meter. You could order

half (or quarter) of a meter of pepperoni, half of mushrooms, etc. The dining area was huge. They brought the pizzas to the table on long stainless steel wagons. They were all delicious. We were the only group eating who didn't appear to be family, definitely not a tourist trap and great fun.

Xmas in Garmisch, 1972

Jennifer was coming home for Christmas from the University of Maryland to Naples. Ellen didn't want to be busy cooking etc. and so not have a chance to visit with her. The U.S. Army had a guest house in Garmisch Partenkirken, so I put my name in the drawing that was to be held for places. As luck would have it, my name was drawn.

Garmisch Partenkirken is a lovely town on a lake and was the site of the 1936 Winter Olympic Games. This meant there were several facilities that were interesting and available for our use. There was a big skating rink complex where I took an ice dancing lesson from a German Olympic team member who skated on this very ice rink in 1936 in the Olympics.

The main lake in Garmisch was frozen solid so Jonathan was able to skate the length of it, something that had not been possible for several years so it was a big buzz in the town. Unfortunately the experience was spoiled for him because he fell and injured a knee, so we spent several hours in the emergency room and he spent the rest of the trip on crutches.

I had planned to take the children skiing but there was no snow that year, except at the top of the mountain. That was a very expensive proposition, with charges for transport to the snow, on top of ski and boot rental, etc. So we decided to give it a pass. There would be other opportunities to try skiing.

The other slight problem was that we all got the flu. We decided nations do not need weapons of mass destruction – just a few flu germs would do the trick.

On Christmas Eve we saw a hillside illuminated with candles. We went to see what was going on and found it was a cemetery. Families placed small Christmas trees with lighted white candles on their loved one's grave and then

just visited them. The only really sad one was a father with two small boys at the grave of their mother. The rest seemed joyous which I thought was a wonderful way to remember Christmases past.

We went to a German restaurant for Christmas dinner and asked for traditional German fare. It was very much to Ellen's liking because instead of turkey there was goose – the bird of her childhood. Everything was really delicious and a nice break from the holiday entertaining Ellen usually did.

Back at the Olympic skating arena there was a contest in progress over several days. We were able to watch the practice sessions and then went to see the finals and root for our favorites from the practice sessions. Unfortunately we weren't able to pick the winner as our favorite lost. We also did some sightseeing to Oberammergau, where the village stages a "Passion Play" every ten years as a promise to God if they could survive the bubonic plague ravaging the region in 1633. We also toured Neuschwanstein, the castle of "Mad King Ludwig" and inspiration for the castle at Disneyland.

London, England, 1972-1975

My tour of duty in England was very interesting. The first thing we had to do was find a house. We had been warned it would not be easy. I went to the Navy Housing Office and they gave me the list to look at – it was pretty slim pickings, but there was one house that seemed possible. I arranged to see it in Gerrards Cross, in what was known as the "stockbroker/ banker belt" because it was an easy commute to London.

The home was impressive from the outside. It had four bedrooms and two baths upstairs, plus a loo downstairs. There was an impressive living room, a separate dining room, a large kitchen with a scullery. It was an impressive house but its elderly owners hadn't done much in the way of maintenance for many years. We decided to rent it, but told the owner the whole of the interior needed to be painted but we would not pay rent while we painted. We even offered to buy the paint. Our offer was accepted.

The lease required us to hire the gardener who had worked for the original owners for forty years. Bob arrived once a week on his moped in a tweed jacket and tie and was paid two pounds. He was slow but managed to cut the grass and trim the hedges. Ellen was required to give him tea with biscuits during his break, and if she was going to be out the day he came, she had to leave the tea in a thermos by the kitchen door. Bob's wife Blanche, spry but getting on in years, was a great help to clean the house once a week.

It turned out to be a good deal. Gerrard's Cross was on the mainline commuter railroad to London. Then a short tube (underground) ride to the American Embassy.

The neighbors were very friendly and we stay with one couple, Lorna and Bill Doughty, every time we go to England. It is a beautiful part of the country in Buckinghamshire, the county where Ellen went to high school. It is close to other attractions (besides London) like Windsor Castle, Milton's cottage, and some National Trust stately homes like the The Vyne, home of Florence Nightingale's sister where she lived at the end of her life, and died. The home of Prime Minister Benjamin Disraeli, Hughenden manor was in High Wycombe nearby. He really connected with Queen Victoria and there are many references to this. Also Waddesdon Manor, the home of Baron Rothschild. There were many other places so when people came to visit, and visit they did, there were lots of attractions to keep them amused.

The plane to the States left in the morning and the one from the States arrived in the afternoon. This just gave Ellen time to change the sheets on the beds from one set of guests ready for the next.

Gerrard's Cross was also surrounded by typical charming villages complete with village green, ancient pub, picturesque church and period cottages.

Another advantage was the opportunities for my two sons. Jennifer, my daughter was at the University of Maryland and came home for the summer. It turned out to be a good experience for her because she thought she wanted to be a

lawyer. She saw an ad on the underground for "law temps" so she thought she would like to do that to get a feel for the law. I asked a fellow member at The Little Ship Club if he knew where that company was. He said she didn't need to bother with that – she could work in his office as secretaries took vacations during the summer. This was a brilliant move as it proved to her that she didn't want to be a lawyer. We joked that when co-workers at Biddle and Co. asked her what temp agency she had used to get the job, she said "I guess you could say the Atalanta agency." Although she didn't like the work, she met some wonderful people her age, like Geoffrey Tyler, Stephen Cox, Anthony MacCaulay and Patricia Thomas, who became regular crew members on my sailboat Patience around the Isle of Wight.

The next summer Jennifer worked for our local council Planning Department in historic Amersham and loved it. She went on to get a Master's degree in City and Regional Planning from Harvard. She has enjoyed her career.

Ellen was not allowed to work, or even fill a significant volunteer position, because of the Status of Forces Agreement with Britain. It was reciprocal and meant that the wives of British posted to the British Embassy couldn't work in Washington. The first year, she took a very interesting course on the history of London, which included a weekly walking tour and museum/historic place visits with knowledgeable guides. She got glandular fever and spent eighteen months in bed. Harley Street specialists confirmed that the only cure was bed rest.

My eldest son, Jonathan, went to London Central High School run by the U.S. Army in Germany. He was able to indulge his love of sailing. He had a class boat, a National Graduate, so we pulled it around the country on a special trailer and sometimes stayed overnight, sleeping in our VW bus that we had driven to England from Naples.

He was also able to go sailing with the Ocean Youth Club. This organization was given about a dozen 72-foot sailboats which they used to take 12 youths plus an adult skipper and

mate deep sea sailing. They went to Cherbourg, France and to Guernsey and Alderney in the Channel Islands. He climbed up the mast to fix a sail and stood "anchor watch" at night, necessary because the tide goes up and down 30-feet every 12-hours. When he first got on board it was necessary to tie a line to a sail with a bowline knot. Jonathan picked up the line to tie the knot when the mate's son snatched it away and said "you have to use a special knot." Jonathan took the rope back and tied a bowline, undid it and tied it with his left hand, undid it and tied behind his back, undid it and tied it with his toes. He had no more trouble with him.

Jonathan also learned to glide. He had the same instructor as Prince Charles, Derek Piggott. I thought if he was good enough for the Queen, he was good enough for me. He also was able to participate in the Duke of Edinburgh Gold Award program run by Prince Philip which included week long treks in the Lake District of northern England.

Jonathan was also able to take advantage of the Outward Bound program to go to Germany for a month, where among other things he was able to try mountain climbing and repelling down mountains. They also offered sailing and as he already knew how to sail he was named "boat führer." At first he was dismayed, thinking führer meant a bad person like Adolf Hitler. He was quickly reassured that it just meant "Leader."

My youngest son Andrew went to a wonderful grammar school, run by the government and not private, Dr. Challoner's, that celebrated its 350th anniversary in St. Paul's cathedral while he was there. He sang in the school choir in St. Paul's as well as caroling in Trafalgar Square at Christmas.

They had a challenging curriculum. Every week he had classes in English, French and German, biology, physics, chemistry, mathematics, geography, history, religious education, music, the "shop" of the term (metal working, plastic working, woodworking), the sport of the term (rugby, cross country, basketball and field hockey), swimming,

football (Americans call it soccer), tennis, cricket, physical education (calisthenics), physical training and games.

The school had an active extra-curricular program. Andrew was able to go to an exchange visit to Grenoble, France for two weeks and a French student stayed with us for two weeks. The next year he went to a small town in rural Germany for two weeks and a German student stayed with us for two weeks.

They also had a computer club. This was early days for personal computers, so access to a computer was rare and precious. On weekends they visited Imperial College or The City University where they were able to use a mainframe computer. In the beginning the club was open to all forms (classes/grade levels), but after a while it was restricted to the upper forms. One of the boys would tell Andrew "We are going to be computing on Saturday. Don't tell anyone!" and they would include him in.

I heard about an organization called the "National Association for Gifted Children." I looked into it and decided to join. They wanted me to pay to have Andrew's I.Q. tested, but I declined. I felt it was an imprecise measurement anyway and I didn't need a test to tell me he was smart. I already knew that. I've known too many people that I didn't think were that smart who wore their I.Q. number like a banner. I gave them permission to test him if they wanted to. They didn't, although they claimed they needed it for their records when applying for grants.

There were two events that happened through participating in the Society. First, Andrew was on a BBC program about gifted children problem solving. We spent a weekend in London during the filming.

The other experience was especially interesting. The ICL (British equivalent of IBM) gave training sessions for executives on using computers. They offered to give a course to members of the National Association for Gifted Children. Andrew was one of those chosen and I agreed to be one of the chaperones. The kids amazed the tutors with how fast they absorbed the

information. It was a residential facility and "lights out" was 10:00 p.m. The children would be very quiet for about half an hour until they thought the adults were asleep (we were), then they would sneak back downstairs and fire up the computers again. At the last session they told the instructor to access a certain file. When he did, the computer thanked them for the course and asked if they could come again.

Andrew got a list of the participants and started C^3 – the Children's Computer Club. I arranged for them to use the computer at The City University some weekends and they would have a meeting. Most of the children lived in the London area so were able to participate easily. One boy lived in Birmingham, so we invited him to stay with us for the weekend. He was very bright but a bit disturbed. His greatest joy was to make the computer crash. He was also a bit of a problem at home. As Ellen was cooking a meal, he would sneak into the kitchen and eat the food already cooked, so when it was time to serve there was almost nothing left. We then found out he had an uncle living much closer to the University so we suggested he stay there. The uncle refused. Problem solved.

When we returned to Bethesda, Andrew went to Bethesda-Chevy Chase High School where Jennifer graduated. We felt it was an excellent school, but it failed Andrew. He was supposed to have taken a test in 9th grade for advanced placement math. Since he was in England at the time, too bad. He had done all the math they were going to do in 10th grade and then some (he had been selected at Dr. Challenor's for advanced "O" levels). He was bored, so did nothing. It was too bad he couldn't finish high school in England.

Island Sailing Club

The Island Sailing Club at Cowes was very convenient to join because I didn't go on cross-channel cruises. When we had our boat at Hamble, Cowes was an easy two to three hour sail. The Club was famous – members were not limited to the island residents. The two thousand members came from all over southern England.

Members can stay there at night, in guest cabins, although we stayed on board our boat. It turned out to be convenient for bringing things back from the Isle of Wight. For example, Ellen would come over on the ferry. When she found some antique stain-glass windows (now hanging in our kitchen in Pacific Grove decades later), she was able to bring the windows to the Club, loaded them on our boat, sailed them back to Hamble and then drove them home in our VW bus.

I sailed twice around the entire Isle of Wight, on our boat and as a guest of other sailing friends who had done it a number of times. One such family were Faith and Peter Futrell. The Futrells lived on the Isle of Wight half the year and wintered in New Zealand, where their son had settled after sailing there. They were completely self sufficient, raising their own goats, lambs, and vegetables. Meals were always memorable – they might say, "Oh, this is Richard," referring to the roast leg of lamb. One time we were getting ready for dinner and they exclaimed "Oh, the salad!" So we piled into their car and drove to a brook in the middle of the island to pick some wild watercress.

Brigadier Templer was another friendly Atalanta owner, living in an old vicarage. We stayed with them several times. He had been a Japanese POW for six years in Singapore. He was a cousin of Field Marshal Sir Gerald Templer, British High Commissioner in Malaya, best known for defeating the guerrilla rebels. In the POW camp, the prisoners took turns giving "lectures" about subjects they were familiar with. He heard a lecture about beekeeping every six months during the six years, so when he retired on disability, he took up beekeeping. He found farmers who welcomed anyone who wanted to set up a beehive and help pollinate the crops. His wife put up 2,000 jars of "Mrs. Templer's Devon honey" every year, a handy cash supplement to his retirement pension.

The English encourage eccentricities in people. By chance we met Frieda Powers in Hamble, when Ellen admired her garden. Frieda lived a house named "The Old House," built in the 1600s. She had divided it so she rented out half and

lived in half. She trained a grapevine to grow in through the kitchen window and across the ceiling so she could pull off grapes growing over the sink. She had gone to Kenya to visit her brother, and ended up marrying a tea planter who was killed during WW II. She was proud of a chair in the living room covered with tiger skin and she had shot the tiger herself! Frieda became included in our Thanksgiving dinner, and since she didn't drive, I would drive to Hamble to pick her up. One year she was staying with her daughter in Kent, down a country lane on a farm. She said there were no house numbers so she would hang a tea towel on the gate so I could find the farm. I was skeptical about these directions but she was right – I was able to see the tea towel and so knew where to stop.

Ph.D Candidate At City University, London, England, 1974-1978

I had been in England for two years. Jonathan had one more year of high school. I had seen how disastrous it was for Jennifer to return to Bethesda for her senior year of high school after she had been away one year. Alliances had been formed and they didn't accommodate a newcomer.

I was due (overdue) for a sabbatical year, so I applied to go to The City [of London] University to work on a Ph.D. This meant Jonathan could finish high school at London Central High, run by the U.S. Army from Germany. This turned out to be a good year for him.

I got engrossed in my Ph.D studies. I could travel on the train and underground to get there. Andrew continued in his excellent English Grammar School (college preparatory high school) and Ellen continued her recovery from glandular fever, which kept her bedridden for 18 months.

The English system for earning a Ph.D differs from the American one. I had a master's degree from MIT so my advisor told me that I had taken enough courses, just to write my dissertation. I originally applied for a master's degree program but he told me I didn't need it and to get on with doctorate research.

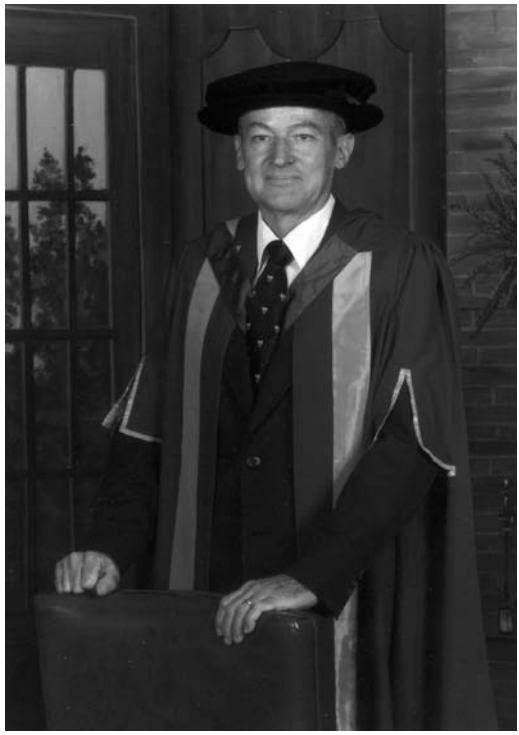
In the U.S., Ph.D candidates defend their dissertation before members of their department. In England they have outside examiners, so the head of the department won't let you go forward until he is 99% sure you will pass.

It was therefore necessary for me to continue my research for several years. I had to return to Washington, but I went back to England for a month each of the next three summers.

It was just my luck that the world's authority on my subject was chairman of my oral exam panel. He asked some very searching questions. Fortunately I was able to answer them to his satisfaction. At the end of the session, he shook my hand and said "Congratulations, Dr. Coile." What a relief!

Ellen asked the head of the department if anyone had ever failed the oral exam. He said, "Only once, and that was someone I advised to wait as he wasn't ready."

All that was left was the graduation ceremony. I took Ellen and the children. Again it was different to an American graduation. The festivities started with a church service, and then there was an elegant luncheon, then the graduation itself. The Lord Mayor of London is Chancellor of The City University, so he was supposed to hand us our diplomas. Sir Seretse Kahma, President of Botswana was at the graduation to receive an honorary degree but he had to leave early to go to the palace for an audience with the Queen and the Lord Mayor was to go with him, so the next in line gave us our diplomas. After I was handed mine, everyone cheered – because I was the last in line to get a degree. Another thing that was different was that we didn't have cheap rented caps and gowns. Mine was made by the Queen's robe maker (since the 15th century), in fine wool, and is complete with a Tudor cap.



My Ph.D graduation photo from The City University, London, England.

Ellen had arranged a dinner at The Little Ship Club for our family and friends. It was the perfect ending to an exciting day.

Little Ship Club

While I was working in London, I joined The Little Ship Club. There was a fantastic clubhouse on a piece of property right on the banks of the Thames that the club had owned for many years. They had classes in navigation and other topics, plus a great place to eat lunch or dinner. It was through the Little Ship Club that I met Lawrence Biddle, partner in Biddle & Co. the City firm of solicitors where Jennifer worked for the summer. I was a member for about fifteen years, including being the "Port Captain" for Annapolis after I returned to the States. When we had my Ph.D graduation dinner at the

club, we served California wine, which all of the Americans attending the graduation had brought over in their suitcases as California wines were unheard of in Europe at that time.

The 1980s

My family were members of the Friends Meeting of Washington. The meeting sponsored an International Student House, still in operation at 1825 R Street, N.W., which went back to the time people of color had a hard time finding a place to live in Washington. I served on the board of directors for several years. One Christmas day Ellen received a call saying twelve students had just arrived from the Middle East. The House kitchen was closed because of the holiday and they had managed to place all their residents, but these students were not expected until later in the week. No provision had been made for them; could we perhaps take two? Ellen asked how many they had left: "eight." She said, "We'll take them." There followed an argument that we should only take two when Ellen said, "do you want to spend your Christmas Day trying to persuade reluctant people to take the other six, or do you want to get on with your celebrations?" They gave up the fight in the face of Ellen's irrefutable logic. "Fine," Ellen said. "We eat at 2:30. Russell will be right there to get them." Pregnant pause on the other end. "Well, it is Ramadan and they can't eat until sundown." Ellen is nothing if not resourceful. Having said we would take them, we would. I called the National Weather Bureau to find out the official time of sundown. Then I called the time signal so we could synchronize our watches. Then I went to collect the students and told them not to worry, they wouldn't be given anything to eat until sundown. Ellen had appetizers ready to put on the coffee table so they (and us) could eat as soon as the official time came. We then had a real Christmas dinner, a bit later, but were happy knowing we had made visitors to our country feel welcome.

After Andrew went off to college, Ellen asked me if it was "her turn." We had spent our free time in Europe accommodating the wants and needs of the boys. She wanted to know if we could do something she had long wanted to do: Scottish country dancing.

She had done some as a child in school, along with other British folk dances, English, Irish and Welsh. The Scottish dances are not "folk" dances, but the dances of the country and are enjoyed by everyone from the Queen on down.

The dances were collected by Miss Milligen in the thirties and forties. She wrote them down so that if you learn a dance in one club, you can dance it at any club anywhere in the world that is affiliated with the Royal Scottish Dance society.

I found there were two clubs in the Washington area, so we joined both and danced twice a week. There were also dance weekends and balls. I found out there was a four week summer school in St. Andrews in Scotland, but it was possible to go for part of the time. I couldn't get off work for a month so we went for the first two weeks.

St. Andrews is a beautiful city more renowned for its golf courses. Miss Milligan had strict rules for the summer school – no trousers in the dining room, for instance. The men were expected to wear a kilt. I knew I had to buy a kilt as I had progressed to the point of being on the demonstration team of our club. I ordered a kilt from the best kilt maker, in Glasgow. I said I would pick it up on my way to St. Andrews.

There was a question of which tartan to use. There is one for the USA so I suggested that. "Is Sir on the stage?" they enquired. "No." "This is rather too theatrical" they said, showing it to me and I had to agree. It was red, white and blue and rather garish. Ellen suggested I take her tartan. As she had taken my name, it seemed a fair exchange, so Clan Gunn it was. Clan Gunn was from the extreme north of Scotland and it is believed was settled by Vikings and were originally Gunnar. As my mother was Norwegian, although I have no Scottish blood in me, there may be some Norse blood in Ellen's clansmen.

When I got to Glasgow, it wasn't that it wasn't ready, it wasn't even started. The length of time usually needed for a kilt to be made is six weeks. I was disappointed to say the least. They asked when I needed it and I said, "today." They said it would be done in a week. So we had to get back on

the train and finish the journey to St. Andrews. When Miss Milligen heard my sad tale she gave me special dispensation to wear trousers in the dining hall until my kilt arrived. A week later I made my way back to Glasgow and collected my kilt. The first time I wore it to the dining hall at St. Andrews, everyone cheered.

Ellen and I dressed for Scottish Country Dancing.

Scottish country dancing is very social – it is danced, for the most part, in sets of six or eight. You really need to know the dance or you can spoil it for 5 or 7 other people. We had an elderly gentleman in each of the clubs we belonged to. One of these gentlemen knew where he was supposed to go but couldn't get there in the allotted time. The other could have got there—if he had known where to go. We promised ourselves that if either Ellen or I fell into either of those categories, we would quit dancing. To our sorrow, the day finally came. It had been a wonderful ride. When we

moved from Washington to California, we found country dance groups and met Gunn clansmen at Highland games in northern California. Ellen hosted Burns night dinners for the Monterey area for a number of years, but without haggis.

Use of Computers for Mechanized Literature Searching in Operations-Research Libraries*

Russell Coile and Baba Foster
***Operations Evaluation Group, Massachusetts Institute of Technology, P. O. Box 2176, Potomac Station, Alexandria, Virginia,* October 3, 1957**

Operations-Research libraries may have large collections of miscellaneous reports. Since OR groups usually have access to modern computers, these computation facilities might well be examined for possible use in mechanized literature searching. Documentation techniques have been developed for computing machines to carry out routine literature searching and preparation of bibliographies. In the multi-concept post-combination system described, the machine searches through a portion or all of the documents listed in its storage and selects only those items with the desired combination of characteristics. Punched cards are used both as input to computing facilities and as manual card catalogs.

During the past ten years a number of new information retrieval systems have been introduced into special libraries. Bohnert[1] gives a good summary of some of these, including the Zator and Uniterm schemes. This paper proposes a system designed to use the flexibility of IBM cards (either with simple IBM accounting and statistical machines or as input to faster machines) to good advantage in the context of an operations-research library.

In this 'concept coding' or 'facet coordination' system, the library cataloger does not make any effort to decide under which of the hundreds or thousands of catalog subject headings the report should be placed; nor are there the problems of subordination of one idea to another. Instead the essence of the report is described in a small number of the most important concepts (key words, ideas, functions, operations, or things). Since an IBM card of 80 columns can be arranged to have about 20 key words on it, this number of concepts has been selected for use in a mechanized system.

Library Title Cards

It is proposed that each report in the research library have a library title card prepared for it on an IBM card as outlined below: Column number

1: Accession bulletin category; Cols 2-7: Library accession number; Cols 8-13: Publishing agency (author's organization); Cols 14-15: Year of publication; Col 16: Security classification; Cols 17-19: Library file drawer; Cols 20-80: Title (spelled out on the card).

Most of the above items are self explanatory, with the possible exception of the Accession bulletin category. It was found convenient in a naval operations-research library to be able to group new reports in the following categories for preparation of weekly accession bulletins: 1. Anti-submarine warfare; 2. Submarine warfare; 3. Atomic warfare; 4. Naval logistics; 5. Naval air warfare; 6. Amphibious warfare; 7. Personnel; 8. Naval subjects-general; 9. Miscellaneous. Other research libraries would obviously want to use a different set of categories.

The use of an IBM card for the library title card enables the IBM machine to print ('interpret' in IBM language) all of the information given in the example on the top of the card. The cards can be handled just as the normal Library of Congress type library cards are handled. A master deck is used by the IBM section for duplicating as many copies of the cards as desirable in the preparation of manual card catalog systems and for printing bibliographies, weekly accession bulletins, or the entire card catalog.

Library Search Card

For each report, in addition to the library title card, a library search card must be prepared. The search card has space for twenty concepts on it plus some of the data from the title card. The bare minimum in common must be a unique reference to the particular document; additional items are added as convenient. Each organization will have its own especially useful techniques. Library Search Card: Column number 1: Accession bulletin category; Cols 2-7: Library accession number; Cols 8-13: Publishing agency (author's organization); Cols 14-15: Year of publication; Col 16: Security classification; Cols 17-19: Author's name; Cols 20-79: Up to 20 concepts, each occupying 3 columns.

A dictionary of concepts called the Concept Coding List must be prepared appropriate for the specific interests of the operations-research group. A three digit number can be assigned to each word in the dictionary. This three-digit system permits the dictionary a maximum size of 999 words. It is considered desirable to keep the dictionary as small as reasonably

possible. The dictionary is 'open ended' in the sense that a new concept may be added at any time if necessary.

The library search card is prepared after an analysis of the report determines the concepts. In order to prepare these search cards, the technical cataloger must read the paper to determine the key ideas which convey the meaning. In general, the journalistic approach of determining who, what, where, when, why, how, and by whom is applicable. Some papers lend themselves very readily to determination of the key words. Other papers must be scrutinized in considerable detail to determine the small number of key words that properly convey the meaning of the paper. Key words must be chosen with care and applied in standard doctrine.

Operation of the Mechanized Literature Search System

The operation of the system may be described briefly by considering the sequence of the events for a hypothetical example:

1. A scientific staff member working on a research project wants to know if the library has any reports on the ranges of detection of atomic-powered submarines obtained by sonar installed on destroyers. He goes to the library and asks for this information.

2. The library discusses search procedures with the scientific staff member before this request is translated into the numeric language of the machine. The computer section therefore first makes a search for all search cards having the combination of concepts of submarines, sonar, nuclear power, detection, and destroyers. The IBM 101 statistical machine can be used to search efficiently for the proper search card as it can scan sixty columns simultaneously. The first search word, for example, 'submarine' (427 to the IBM machine), is set up in each of the twenty IBM fields because the word submarine may appear at random in anyone of the twenty fields on the cards. The entire deck of library cards is then passed through the IBM 101 and all cards involving submarines will be extracted. The second term is then searched for in this smaller group. Anyone of the search words can be used first. As a matter of fact, in the interest of getting a rapid convergence of the desired deck of cards to be extracted, one of the more specialized words might be used first. The IBM 101 can search for a single word in each of the twenty fields of three columns in one pass. The IBM 077 collator, which can only search ten columns at a time, would have to have the cards pass through seven times. When the split sequence selector attachment is available, the collator can search 24 columns at a

time. When a group of cards has been extracted that all contain one search word, the second search word is sent into the machine and the small group passed through to pick out those cards with the combination of the two words. This new extracted group is then passed through the machine with the third search word to select the cards with one combination of the three search words. This converging process is continued until a desirably small number of cards is obtained or the particular detailed search is carried out to completion.

There are a number of techniques that may be employed to reduce the over-all search time. For example, one may wish to limit a search to papers published during the war, after the war, during the past two years, etc. A preliminary sort can be done on columns 14 and 15 to use this time factor. Similarly, if one knows that the desired group of reports was written by the Naval Research Laboratory, or by the Rand Corporation, a preliminary search can be made on columns 8 through 13 to get a group of the proper cards of a particular publishing agency. Furthermore, in some cases one may know that the particular reports desired were of secret classification. A simple one-column sort of column 16 extracting the secret reports may be of value. Any other sorts of data may also be used–here the requirements of each organization will be different and it should be emphasized again that each group must adapt the system to its own purposes.

The first three letters of the senior author's name are placed in columns 17, 18, and 19. These letters plus the author's organization of columns 8 to 13 will enable searches based on the author's name.

3. When a group of search cards has been sorted and found to have the desired combination of concepts, the collator will sort out the matching library title cards by using the common library accession number in columns 2 through 7. The title cards are then placed in the IBM 407 printing tabulator and all information on the library title card is printed on a sheet that is given to the scientific staff member requesting the particular search.

Disadvantages of the Mechanized Literature Search System

The use of computing equipment in this application to library techniques immediately raises a question as to the cost of this approach. Computing machines are expensive to rent and require trained personnel. Ideally, the machines should be already on hand for other problems of the operations-research group. The machines desirable for literature searching are the IBM

101 statistical machine and the IBM 407 printing tabulator. It is estimated that if the IBM 101 is used approximately 80 per cent of the time on library searches, the IBM 407 printing tabulator would correspondingly be used about 25 per cent of the time on printing bibliographies. It should be pointed out that the IBM 407 is currently in use in many laboratories for printing and tabulating a wide variety of problems.

The principal disadvantage of the mechanized system is the tremendous effort involved in the requirement for a trained technical cataloger to examine each document, to select up to 20 concepts, and to prepare coding sheets for keypunching. It has been estimated that approximately 100 documents per week per cataloger only can be cataloged.

Another disadvantage of the mechanized system is that only the title (and that perhaps somewhat abbreviated to fit into 60 spaces) will appear on the printed record. Reports with meaningful titles will not cause any confusion by this procedure, but those reports whose titles do not clearly indicate their subject matter may not be very helpful to the customer, since one must then actually dig out the individual report to find out what it is about.

Abstracts can be provided if desired on the Library Title Cards. Microfilm frames can be inserted into the IBM card by a process developed by Filmsort, Inc., of Pearl River, New York. One to four frames of 16 mm microfilm can be mounted on the card. For example, two 8½ X 11-inch pages can be reduced by a factor of 16 and mounted in the space required of eight IBM columns. Four microfilm frames would occupy 16 columns.

A further disadvantage of the mechanized system is that only one search can be conducted at a time. This indicates that this particular machine method is not designed for quick use of a large number of customers; nor, it should be added, is it designed for a specific request. It is suggested that scientific staff members who have a great deal of familiarity with a particular subject under investigation and basic sources of material would be advised to look in a manual card catalog. It is, however, intended for the large-in-scope, generalized, 'what's in this area?' kind of search.

Advantages of the Mechanized Literature Search System

The primary advantage of the computer search system is that it is a 'consumer' system. The scientific staff member merely asks a question and then goes away while the machine carries out all of the drudgery of searching. Naturally a good deal of work has to go into preparing the original

Concept Coding List and the actual technical cataloging, but once the title and search cards have been prepared they are available forevermore.

Another advantage of the mechanized system is that the cards for a complete manual card catalog system can be prepared by the machine. The use of punched cards for manual card catalogs allows the complete manual card catalog to be printed and bound in a volume available for scientific staff members to use in their own offices or laboratories.

A daily or weekly accession bulletin can be published with a simple procedure of the IBM 407 printing tabulator cutting the ditto master directly. The library actually can use the IBM cards to prepare three listings: *(a)* sequentially by library accession number, *(b)* grouped by accession bulletin category, and *(c)* grouped by author's organizations. The daily or weekly accession bulletins permit a 'demand routing system' whereby the scientific staff member requests only those reports he is interested in at the moment.

* This paper is based upon a report presented at the Fifth Annual Meeting of the *Operations Research Society of America* in Philadelphia, Pennsylvania, May 10, 1957.

1. L. M. Bohnert, 'Two Methods of Organizing Technical Information for Search,' *American Documentation* 6, 134-151 (July 1955).

Quick Analysis of NATO Anti-Submarine Warfare (ASW) Exercises:

"Analysis of Large-Scale NATO Naval Exercises (U)." Paper presented at the NATO Conference on the Role and Evaluation of Military Exercises in Operational Research, London, England, 25 August 1964. Published in Vol. I of *The Proceedings of the NATO Scientific Affairs Division Conference on the Role of Evaluation of Military Exercises in Operational Research*, pp. 74-108, London, England, August 1964.

I would like to describe briefly a new method which has been proposed to assist us in the analysis of NATO ASW exercises. This method for quick analysis of ASW exercises has several potential applications.

Exercises which would not be reconstructed and analyzed can be quickly analyzed for approximate results.

Exercises which are scheduled for complete reconstruction and analysis can be quickly analyzed before reconstruction in order to highlight and pinpoint both the important events and the time intervals when no interactions are taking place to assist the analysis team in organizing the reconstruction.

Both type of exercises (those without reconstruction and those with reconstruction) can be quickly analyzed before the hot wash-up post exercise discussion in order to have preliminary exercise results available for the hot wash-up.

Operational readiness of NATO Naval Task Forces in peacetime is maintained through exercises that simulate combat. Tactical development and evaluation or operational readiness objectives are often addressed in these exercises. Since 'training' is usually the primary objective of an exercise, it is sometimes difficult to collect data without interfering with the operation of the ship or the training of individual crew members. Data, however, is necessary to assess quantitatively the state of operational readiness or the effectiveness of new tactics and new equipment.

Several questions arise: How can ASW exercises be analyzed and evaluated without interfering with shipboard operations or distracting the personnel involved from normal operational duties? How can exercises be

analyzed without a tremendous effort by men and computers for a period of weeks? In fact, can exercises be analyzed promptly so that preliminary results are available in time for the hot wash-up?

Recently, a new idea for quick analysis of NATO ASW exercises has been proposed. This method uses data obtained from normal operational message traffic rather than requiring operating personnel aboard ships or aircraft to fill out special data recording forms such as the NAVSEX or OPNAV 3360 series forms. General results can be available in time for the usual 'hot washup' post-exercise discussion. Even if only rough order of magnitude results are available, the information will be important since exercise participants should be able to get an early feeling for overall results, particularly if new ships, new aircraft, new equipment or new tactics are being evaluated.

The basis of this method is the use of normal operational message reports rather than special data forms. For example, each maritime patrol aircraft crew is required to send a 'Purple' RAINFORM message within a few hours after completing a mission. This formatted message contains concise highlights of the mission including times 'on' and 'off' station and details of all enemy contacts.

During the period of the exercise, the analyst reviews each 'Purple' message received and extracts details of each contact, such as the location, identity, whether or not ASW attack criteria were obtained, an ASW attack was simulated, etc. The analyst the prepares a blue ASW contact log of all ASW detections and attacks and is thus working with just a few hours delay from real-time.

The analyst is similarly reviewing tactical message traffic from ships for ASW contact and attack reports. Similarly, the ASW contact reports from direct-support submarines, and carrier-based ASW fixed-wing aircraft and helicopters are incorporated into the blue Master ASW contact log.

The assessment and classification of these blue contact reports into valid and false contacts is done with the cooperation of the orange submarine commander. The analyst must arrange with the orange headquarters to receive a summary report from each orange submarine after the end of the exercise. These orange reports would contain data as to time and location of each submarine's attack on a blue ship, assigned patrol zones, daily noon positions, comments on blue ASW attack effectiveness, etc.

A summary of the orange submarine attacks and the blue ASW detections and attacks can then be prepared. One way of illustrating the summary uses a display with symbols. An opportunity for a blue ASW unit to detect an orange submarine is shown as a circle. (An opportunity is defined to be the presence of an ASW unit on station with an ASW screening responsibility.) A detection is shown as an 'X' superimposed on the opportunity circle. An ASW attack following a detection is illustrated by a bulls-eye superimposed on the detection 'X' and opportunity circle. The orange submarine's attack on a blue ship is shown by a periscope symbol.

A typical sequence of an orange submarine's attack on a blue battle group with opportunities for ASW action by various ASW systems. For example, the primary target may be defended by blue VP, VS, HS, LAMPS, and FF. The disposition of these ASW units might be in annular range bands as illustrated. Any detections by the un-alerted ASW units of the submarine on its approach leg would indicated by an 'X' in the opportunity symbol. Similarly, any detection and ASW attack of the submarine on its escaping post-attack leg after a green flare 'flaming datum' sub attack would be indicated on the withdrawal leg by appropriate symbols.

The limitations of this method of analysis must be kept in mind. This quick method does not have the accuracy of proper reconstruction. The opportunity data may sometimes be fuzzy, although the attack data is straightforward and firm. However, if an exercise is not being reconstructed at all, this rough and ready method gives a tremendous amount of useful information for a small investment of analysis effort. It does provide timely quantitative data to the participants at the post-exercise conference when they need it. And a quick analysis of an exercise before reconstruction commences will help the analysis team plan the track reconstruction and data analysis phase of its work.

Information Sources for Electrical and Electronics Engineers

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Abstract

Sources of information for electrical and electronics engineers have been studied by looking at 1965 IEEE publications to see what periodicals, books, conferences, etc., were cited. Cited journals have been ranked as information sources by the number of times they were cited as references. The data for 1965 have been compared with corresponding data for 1949 and 1934 to examine trends in volume and characteristics of reference information, country of publication, and age of reference.

Introduction

The references in 1965 IEEE publications have been examined to determine information sources used by IEEE authors. The IEEE publications surveyed were the Proceedings and the 33 Group Transactions and Journals. During 1965 there were a total of 22,235 references cited in these IEEE publications. The references have been classified as books, journals, conferences, etc. (see Table I and Fig. 1).

Periodical Literature

There were 5,979 citations to 45 IEEE (including AIEE and IRE) periodicals. Table II is a detailed list of IEEE sources. The 7,784 references to periodicals other than IEEE involved 766 different journals. Table III lists the 60 non-IEEE journals most frequently referenced in 1965, ranked by number of citations.

Fig. 2 graphs distribution of citations among periodicals other than those published by IEEE. Fifty percent of the references in 1965 cited only 18 journals, 75 percent cited 73 journals, and 90 percent cited 238 journals of the total of 766. If a library desired general coverage (in addition to that provided by IEEE publications) of at least 50 percent of the world's electrical and electronic periodical literature, it would need at least these

top 18 journals. Specialists, of course, might require a group of additional publications. If a library is providing research information on acoustics, for example, it would need such major acoustical periodicals as the *Journal of the Acoustical Society of America, Journal of the Audio Engineering Society, Akustichesku Zhurnal* (or the translation: *Soviet Physics-Acoustics), Journal of Sound and Vibration, Journal of Underwater Acoustics, Acustica, Journal of Auditory Research,* etc.

Comparison of 1965 Data With Data for 1949 and 1934

Data for 1949 and 1934 were likewise examined. All references in the publications of the two organizations (The American Institute of Electrical Engineers and the Institute of Radio Engineers now combined into the Institute of Electrical and Electronics Engineers) have been analyzed using the information from earlier studies [1], [2]. In 1949, there were 973 citations to 186 other journals in addition to 670 citations to AIEE and IRE publications (381 citations to *Electrical Engineering* and *AIEE Transactions* and 289 citations to *Proceedings of the IRE).* These 670 citations to AIEE and IRE publications in 1949 may be compared with the 5,979 citations in 1965 to IEEE publications. Fig. 2 shows that in 1949, 50 percent of the references were to 14 journals, 75 percent to 43 journals, and 90 percent to 94 journals. Table IV lists the 60 journals most frequently referred to in 1949.

In 1934 there were 894 reference citations to 67 journals other than AIEE and IRE publications. This might be compared with the 1965 data of 7,784 citations to 766 journals. Fig. 2 shows for 1934 that 50 percent of the references were to 10 journals, 75 percent to 20 journals, and 90 percent to 33 journals. Table V lists the 20 journals most frequently used in 1934.

Country of Publication

Tables VI and VII, present data on the country of publication for all journals cited in 1965 and 1949. Fig. 3 shows the distribution of the most popular journals cited during 1965 by countries. The 1965 data show that 454 American journals comprised about 55 percent of the number of journals and about 82 percent of the total number of reference citations. In 1949, 119 American journals made up 63 percent of the number of journals, while in 1934, 31 American journals were 45 percent of the total. British journals accounted for 11 percent of the total number of journals

in 1965, 12 percent in 1949,and 19 percent in 1934. German journals accounted for 7 percent in 1965, 9 percent in 1949, and 22 percent in 1934. In 1965, 30 Russian journals (4 percent) were cited, compared to 4 in 1949 (2 percent) and none in 1934.

Reports

In 1965 there were 2,408 references to reports and memoranda from various laboratories, industrial companies, government agencies, colleges, nonprofit research organizations, etc. There were 520 different sources for these reports and memoranda; Table VIII summarizes the reports most frequently used as references.

Fig. 4 graphs the report coverage for organizations other than the IEEE. It will be seen that 50 percent of the report citations were to 38 report organizations, 75 percent of the citations were to 129 organizations, and 90 percent of the citations were to 276 of the total of 520 report sources referred to. In addition to these 2,408 references to 520 report sources, there were 30 citations to 7 IEEE, AIEE, and IRE reports and standards.

This growth of the use of reports and memoranda is one of the most significant changes in the sources of information for electrical and electronics engineers over the past few years. By contrast, in 1949 there were 63 report references to 18 different organizations. In 1934 there were only 10 report references to 2 different organizations.

Meetings

In 1965, there were 684 references to 18 IEEE, AIEE, and IRE technical meetings, conferences, symposia, and conventions. There were 1,285 references to 335 other meetings. Fig. 5 shows that 50 percent of the references to other than IEEE meetings were to 34 different meetings, 75 percent were to 96 meetings, and 90 percent were to 189 of the total of 335 meetings.

Useful Lifetime of Published or Presented Papers

The useful life of research has been examined by tabulation of the time interval in years between presentation or publication and the subsequent reference citation to this research.These 1965 data on the ages of reference citations are illustrated in Fig. 6. It will be seen that 50 percent of the references to meetings were to meetings held less than 2 years previous, 75 percent were to meetings held less than 4 years earlier, and 90 percent

were to meetings held within the previous 7 years. The life of a report was longer, with 50 percent of report references being to reports less than 3 years old, 75 percent to reports less than 5 years old, and 90 percent to reports less than 10 years old. With respect to periodical literature, it was observed that 50 percent of the references to periodical literature were to periodicals less than 3 years old, 75 percent were to less than 7 years old, and 90 percent were to periodicals less than 13 years old.

A previous survey of periodical literature for electronic engineers [1] had shown that the age of 50 percent of the references was less than 3 years, and that 75 percent were less than 9 years old. A similar previous survey of periodical literature for electrical engineers [2] had found a longer time interval between publication and use in subsequent research. The age of 50 percent of these references was less than 4 years and 75 percent were less than 11 years.

The tremendous increase in the volume of citations to periodical literature and the increase in the number of journals referred to between 1949 and 1965 thus seems to have been accompanied by a speedup of obsolescence as evidenced by this decrease in the useful life of this published research.

Associative Trails

If an individual is hunting for some information pertinent to his current research, it would seem appropriate for him to begin the associative trail type of retrieval with a look through the most recent issues of the top ranking periodicals down to the 50 percent coverage level. He then has some probability of uncovering papers of interest which also might have references which might be the clues for further searches. In some fields, of course, specialized periodicals such as *IEEE Transactions on Audio and Electroacoustics,* or the *Journal of the Acoustical Society of America* might be the place to start.

Abstract Journals

A monthly abstract journal, *Electrical and Electronics Abstracts* (EEA), is published jointly by the Institution of Electrical Engineers (London) and the Institute of Electrical and Electronics Engineers with the cooperation of Engineering Index. Such a journal naturally must be selective in the choice of periodicals to be scanned in the search for technical papers worth abstracting. The highest ranked 18 periodicals which covered 50

percent of the reference citations were all scanned by EEA. EEA also scanned 47 of the 54 next most important periodicals and 81 of the next 164 journals, which covered up to 90 percent of the 7,784 references involved. Finally, EEA scanned 149 of the final batch of 528 periodicals of lesser importance.

Abstract journals now must consider the growth in importance of reports, monographs, and memoranda. The present haphazard and varied private distribution schemes may not bring reports to the attention of either abstract journals or many individuals who might be interested in that particular topic. The state of affairs in 1965 resulted in extremely limited coverage by EEA of report sources.

Table I showed that more than 10 percent of the 22,235 citations in 1965 were to reports originated by 520 different report sources. It would seem desirable for the IEEE and IEE to try to work out some system for their members who publish reports to ensure that EEA receives a copy of each report for consideration for possible abstracting.

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[1] R. C. Coile, 'Periodical literature for electronic engineers,' *Proc. IRE,* vol. 38, pp. 1380-1384, December 1950.

[2] R. C. Coile, 'Periodical literature for electrical engineers,' *J. Doc.* (London), vol. 8, pp. 209-226. December 1952.

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Professional Paper No. 187, April 12, 1977, Nomography For Operations Research

Paper presented at the Joint National Meeting of the Operations Research Society of America and The Institute for Management Services, San Francisco, California, 9 May 1977. The views expressed in this paper are those of the author and do not reflect those of the U.S. Navy, the Department of Defense, or any other Government agency.

Abstract

Nomographs have been found to be useful in operations research. These charts for graphical computation have the advantages to the user of being non-electronic, quick, and easy to use. They can be designed to present complicated mathematical formulas in a simple format to non-mathematical people. Disadvantages are the slide-rule type accuracy and the possible lack of 'feel' that families of curves might possibly give.

Research on applications of nomographs in solving operations research problems has lead to development of some procedures for simplified design of nomographs. Examples of nomographs for acoustical design, radar, and sonar illustrate these procedures.

Introduction

Nomographs are charts for graphical calculations. Nomography was invented by a French engineer, Maurice d'Ocagne, in 1884. He coined the word 'nomography' from the Greek *nomos*, law, and the Greek *graphos*, drawn or written, to describe these graphical representations of mathematical laws. Nomographs are also called nomograms or alignment charts.

Nomographs have a number of advantages over other methods of computation in some operations research situations. They are non-electronic, quick and easy to use. They do not require interpolation. The designer of the nomograph can pre-digest the mathematics and make the graphical computation palatable for non-mathematical people. Also, some problems permit a translation of variables into more familiar terms. The disadvantages of nomographs are the lack of accuracy and the lack of 'feel' that some graphical displays of curves might give.

The approach I will use this morning is to show you how easy it is to construct nomographs for operations research applications.

First we will examine the classification of equations into the types that are appropriate for nomography. Then we will use a worksheet for planning the scale equations and scale spacing. Finally, we will use plotting charts to mark the scales. Then I will show you some examples of nomography. As a matter of fact, may I show you one example right now? Suppose you were concerned with Doppler shift in underwater acoustics as a function of relative velocity and sonar frequency. The nomograph for Doppler Shift has three scales: Δf, doppler shift in Hertz; v, relative velocity in knots; and f sonar frequency in kiloHertz. The nomograph is a graphical representation of the formula $\Delta f = (2v/c) f$ where c is the velocity of sound. To use the nomograph, one can lay a straight-edge between 5 knots on the relative velocity scale and 20 kiloHertz on the sonar frequency scale and read the answer of 70 Hertz on the Δf doppler shift scale.

Construction of Nomographs

The first step in nomography is examination of the mathematical formula. Nomographs can usually be constructed for equations of three variables which are or can be manipulated into the form called Type I below.

Type I equations: $f_1(x) + f_2(y) = f_3(z)$

Nomographs can similarly be constructed for equations of four or more variables of the Type II form.

Type II equations: $f_1(x) + f_2(y) + f_3(z) = f_4(r)$

To construct a nomograph, we must work out the plotting equation for each line after we have decided on the general approach and the spacing between lines. A nomograph Work Sheet helps organize these calculations. An example has been worked out for a military problem of estimating the possible radius of an enemy submarine's escape circle after loss of contact by an anti-submarine ship. In this example, vt = r where v = submarine speed in knots; t = elapsed time in hours; and r = radius of sub escape circle in nautical miles.

Some nomographic plotting charts developed at MIT's Mathematical Laboratory in 1918 by Professor Joseph Lipka (Reference l) will be found to be useful in marking the scales. Both uniform arid logarithmic scales can be easily marked using these MIT charts.

Nomographic Accuracy

Nomographs have slide-rule type accuracy. Nomographs constructed in the original French style originated by d'Ocagne have poorer accuracy as the number of variables increases. However, Professor Brodetsky (Reference 2) of Leeds University in England developed a method for preserving accuracy no matter how many variables are involved. For example, a nomograph for the multiplication of (X) and (Y) in the French style results in the product answer (XY) on the inside being at half-scale. The English method would put the answer on the outside at full scale. Similarly, the multiplication of (X), (Y) and (Z) in the French style ends up with the (XY)Z answer on the inside at one-quarter scale. The English method preserves full scale accuracy for the answer on the outside. Division is handled in a similar fashion.

An example of seven variables illustrates how powerful this English method is. Professor Brodetsky also suggested starting with the evaluation of the denominator first in the sequence of calculations. Hence in the design of a nomograph for A = XYZ / PQR, what we actually do is consider this to be A = ((X / (PQ) R) Y) Z and begin with PxQ, then (PQ) x R, etc.

Logarithmic Vs. Linear Scales

Some nomographs may be easier to use if made with linear rather than logarithmic scales. The nomograph for X = YQ / Z can be designed for either logarithmic or linear scales as illustrated.

Examples

A nomograph which could be used in search and rescue operations for planning the number of aircraft required to search an ocean area for an aircraft forced down at sea is based on the following expression given by Morse and Kimball (Reference 3): $p = 1 - e^{-(WLN / A)}$ where p = the percent chance of detection; W = sweep width in miles; L = length of search track; N = number of search aircraft; A = area to be searched in square miles.

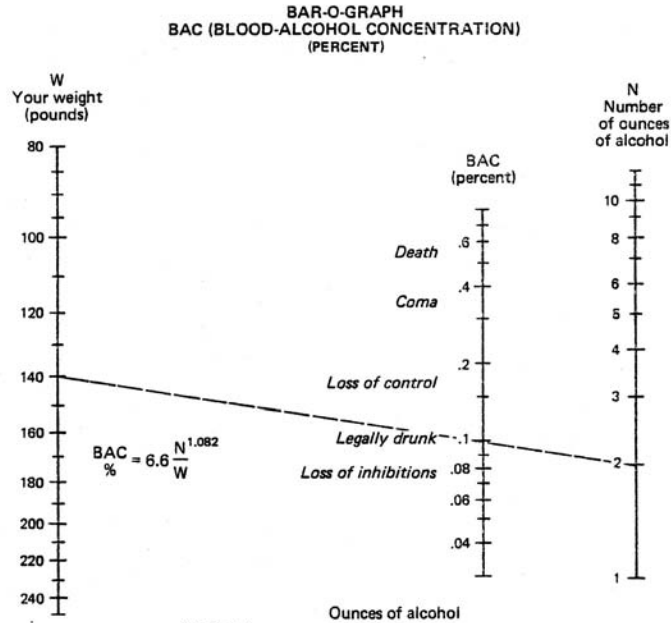
The target strength of fish as a function of size (length, actually) and sonar frequency is based on the following expressions developed by Love (Reference 4).

$T_D = 19.1 \log L + 0.9 \log w - 34.2$

$T_S = 22.8 \log L - 2.8 \log w - 32.4$

where T_D = target strength in dB for dorsal aspect; T_S = target strength for side aspect; L length of fish in feet; and w = wavelength of sound in feet.

A BAR-O-GRAPH nomograph of blood-alcohol concentration in percent has been designed to assist in determining when enough is enough. Various states have different levels of blood-alcohol concentration for legal definitions of intoxication. At the time this nomograph was prepared, the official BAC level in California was 0.1%. If you weigh 140 pounds or fewer, it would not appear to be prudent (or legal) to drink more than two Manhattans within an hour at the ORSA mixer tonight if you plan to drive shortly thereafter.



Ounces of alcohol

Number of drinks	Beer	Old Fash. Daiquiri	Manhattan Martini
1	.48	.6	1.05
2	.96	1.2	2.1
3	1.44	1.8	3.15
4	1.92	2.4	4.2

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Professional Paper No. 189, July 1977, Error Detection In Computerized Information Retrieval Data Bases

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Abstract

The introduction of on-line interactive literature searching systems in recent years has made it possible for information scientists to conduct bibliometric studies which might have been difficult or impractical to do by manual methods. The unconventional uses of on-line information retrieval systems are becoming more common as we learn how to search using non-subject information fields. Author's name, organizational affiliation, journal's name, year of publication, etc., can now be searched for easily.

However, sometimes there are problems. For example, if the name of the author in a database such as MEDLINE is given with initials for first and middle names, Bloggs, J. B. may be confused with Bloggs, J. B. since Joseph Blackwell Bloggs may be a mathematician while James Blackwood Bloggs is a chemist.

It would seem worthwhile for those responsible for management of these mechanized information storage and retrieval databases to attempt to use all economically feasible error-detecting and correcting schemes to reduce the error rate as much as practicable. Several suggestions for detecting errors have been examined.

Introduction

Mechanized information storage and retrieval systems have brought a new era to information science and library operations. However, along with added flexibility and speed of searching and retrieval, we have become faced with more stringent requirements for accuracy in databases. Unconventional uses of on-line information retrieval systems are becoming increasingly common as we learn how to search using non-subject information fields.

We can now search easily using author's name, organizational affiliation, journal's name, and year of publication.

However, the increasing volume of scientific and technical literature has provided an impetus for more automatic error detection procedures to supplement the traditional human error detection and correction routines. The question to be considered is whether or not the combination of human and computer error detection systems is now able to cope with the volume of scientific literature.

Errors in Data Bases

For purposes of discussion, some of the illustrations of types of errors will be drawn from the Science Citation Index. This should not be misconstrued as being an attempt to publicize any presumed shortcomings of this database. On the contrary, the Institute for Scientific Information has already taken extraordinary steps to correct errors in its databases. As Sher (1) pointed out in a symposium on error control in chemical literature during a meeting of the American Chemical Society in 1966, the data found in *Index Chemicus* are sometimes more accurate than in the original article from which the abstract was prepared. The error detecting procedures apparently included recalculation of molecular formulas by chemical abstracters who then requested the original author to confirm corrected errors.

We must also keep in mind that there may be different orders of importance of errors. Dr. Cawkell (2) classified errors in Science Citation Index into two major classes. A class one error would be one in which the result is that an item is very unlikely to be retrieved in consequence. A radical misspelling of an author's name might be an example of a class one error. A class two error would be of the kind which will usually not result in retrieval loss. For example, a non-standard abbreviation of a journal title might be a class two error since the cited item would appear beneath the correct cited author, usually in juxtaposition to the same item correctly cited (always assuming that the item has been cited more than once).

Errors in Primary Literature

Some errors originate with the author. For example, an erroneous reference or mathematical error will be published if it is not noticed by the referees and the editor. When the error is subsequently detected, an erratum may be published. If a reader detects the author's error, a reader's

letter to the editor may be published. The Science Citation Index serves a useful function in alerting people to this method of error correction just by tying together the later letter to the editor with the correction to the original publication which contained the error.

Even if the author were correct, errors might creep in through typographical misprints. An example of a minor typographical error is illustrated by a point raised in a letter to the editor (3) which commented that a paper had listed Alfred J. Lotka with the wrong middle initial of 'K' in the first reference although correctly as 'J' in another reference. Unfortunately, the Institute for Scientific Information's automatic error detection and correction program which will correct the misspelling of an author's name didn't catch the wrong initial, and the initial listing in the 6 Jul - Sep 1974 LAHI to Z Science Citation Index repeated the error. The subsequent 1970-74 summary compilation corrected this error. Another minor typographical error which slipped past the automatic error detection and correction program for misspelled author's name is illustrated by Droop's entry in the 1970-74 SCI for 'Lotke, A. J.; 25 Elements Physical Bi; Droop MR Am Zoolog 13 209 73.' There were actually 49 citations earlier to 'Lotka, A. J.; 25 Elements Physical Bi' and in theory, the computer should have noticed the misspelling of Lotka. Several other examples of errors are discussed in another letter to the editor (4). The author's name of a reference had been misspelled, i.e. Learnes was listed instead of the correct spelling of Leavens. The name of the journal, *Econometrica*, and the year, 1953, were correct in this case. A more serious error, perhaps, was the statement in the paper that a particular 1941 reference showed that the number of authors fit a Yule-type distribution. First, this reference was the wrong reference since it didn't discuss the Yule-type distribution. Second, the correct reference, which was not given, should have been to a paper by Simon (5) in 1955 who had examined a probability model developed in 1924 by Yule (6) in connection with analysis of the distribution of biological genera by number of species. Simon had proposed the application of this Beta-function model to frequency distributions of scientific publications, calling it the 'Yule' distribution. In this case, having the wrong reference is probably a less important error than error of omission of the correct reference. Looking up the wrong reference may be a waste of time and frustrating, but not being able to consult the correct reference might waste a good deal more time in Sherlock Holmes type activity to find it.

Science Citation Index

There are several potential problems for a citation index. The first of these is the question of the cited author's name. The author might change the way he writes his name as author of a paper from time to time. He might be C.N. Parkinson on one publication, C. Northcote Parkinson on a second, Cyril Northcote Parkinson on a third, and (although I have not seen it) Cyril N. Parkinson on a fourth.

The author might complicate things by changing her name upon marriage. The author might change his or her name after emigrating. Derek John Price of the S. W. Essex Technical College wrote all of his 1946-l949 papers on infra-red emissivity of metals at high temperatures, etc. as D. J. Price. Derek J. de Solla Price (7) on this side of the pond wrote that classic, *Little Science, Big Science* in 1963. However, Derek de Solla Price (8) is now the author's preference. The Library of Congress apparently disregards an author's preference and has an old-fashioned concept that consistency is a great virtue. All of the relevant catalog cards adjacent to the main reading room in Washington have been painstakingly altered to 'Derek John de Solla Price.' These include all the old Derek J. Price cards with John de Solla added as well as the newer Derek de Solla Price ones with John added.

Finally, let us suppose that the cited author is consistent for fifty years or more and always uses the same name, e.g. Joseph Blackwood Bloggs on all of his papers. Various citing authors may either: a) spell out his name in full, b) use initials, i.e. J. B. Bloggs, c) use combinations of spelling and initial, i.e., Joseph B. Bloggs, d) use less than complete names, i.e., Joseph Bloggs, or e) use less than complete initials, i.e., J. Bloggs. And, of course, in addition to these variations of the citing authors, the editors of different journals may have different policies as to names in references.

The overall result of all of these variations is what might be expected. Table 1 illustrates the problem of one who has a longer name than the customary American-style John C. Doe. The citations to *Little Science, Big Science* over a ten year period give more of the so-called 'Brownie Points' to Price, D.J.D. than to any of the other variants including the author's new preference for Price, DDS.

While on the subject of errors introduced by the citing authors, may I point out that although *Little Science, Big Science* was published in 1963, there are publication dates of 1965 in the 1968 SCI volume, of 1968 in

the 1970 volume and of 1970 in the 1973 volume. Furthermore, some additional errors slipped through the system with entries for *Big Science, Little Science* published in 1963 in the 1967 and 1971 volumes as well as *Big Science, Little Science* 1964 in the 1973 SCI volume.

Suggestions

What can be done to improve error detection and correction procedures? Would it be economically feasible to add a computer error-detection program that would sort and group together in some editing file all items with the identical cited paper (or book) particulars and identical cited author last name? For example, before everything for a year is loaded into the masterfile, if items were put into a working file where a printout of the group of all references to 63 *Little Science, Big Science* with cited author's name of Price were produced we would see something like this:

PRICE D — 63 LITTLE SCIENCE, BIG S
PRICE DDS — 63 LITTLE SCIENCE, BIG S
PRICE DJ — 63 LITTLE SCIENCE, BIG S
PRICE DJD — 63 LITTLE SCIENCE, BIG S
PRICE DJS — 63 LITTLE SCIENCE, BIG S

The error-detecting program would make the initial sorting on last name only, not using any initials. Then it could make comparisons of initials to see if the identical initials are present. Rules for correcting the erroneous initials could then be applied by a human editor to add, subtract or change initials to one standard identical set of initials for all the identical cited papers (or books). Correction of the author's initials might be based on a review of the cited document, or inspection of *American Men of Science*, or *Who's Who*, or previous year's SCI, etc. to determine what the cited author's first name and middle name(s) actually are. The first letter of the first name should obviously be used and then the first initial of each middle name should be used in sequence up to the computer's limit of three initials. I would vote for using the first initial of each particle as if they are middle names. Thus Derek J. de Solla Price would be 'PRICE, DJD.' The computer could be reprogrammed for automatic inconsistency correction if the human editing was deemed too expensive. For example, the computer could select the most popular variant of initials. Price, DJD was the winner in each year from 1964 through 1973. Or the computer could check with data already in file for the previous year and be consistent from year to year. If the previous year had several variants this might be used to alert

someone or the computer itself to keep on going back in time until it found a unique entry of initials and then make everything identical. One could almost argue that consistency, even if it were consistently wrong, would be preferable to sometimes right, sometimes wrong.

Most of the discussion above concerns the inconsistencies of various combinations of initials associated with the author of a particular cited document. I have only mentioned the problems of the document such as the various erroneous years of publication that were given to *Little Science, Big S.* nor have I considered the errors in titles such as *Big Science, Little S.* Of even greater importance is a big problem. How does one get all the cited documents credited to the true author? After a computer or human editing decision which decided that only Price, DJD was indeed author of *Little Science, Big S.* how does one devise a system to get 'PRICE DJ 47 P PHYS SOC 59 131' which was correct at the time and is still correct but inconsistent with the new 'PRICE DJD' to be credited to Professor Price? And how does one get all papers by Price listed as 'PRICE DJD' if the citing author only refers to him as 'PRICE D?'

Journal Titles

Journal titles have problems similar to those of names of authors. A journal may change its name. For example the *Journal of Terrestrial Magnetism and Atmospheric Electricity* after 52 years of publishing suddenly became the *Journal of Geophysical Research.* After only three years, the *Journal of the Operations Society of America* became *Operations Research.* The *Forestry Quarterly* and the *Proceedings of the Society of American Foresters* united in a new *Journal of Forestry* which continued the volume numbers of the *Forest Quarterly.*

Citing authors may use different abbreviations for journal titles or various editors may use different abbreviated titles.

How do various data bases cope with journals with the same title e.g., *Journal of Education* published in Boston, Massachusetts and the *Journal of Education* published in London, England?

Can citing authors be depended upon to give the full title to journals to avoid confusing *Library Science and Documentation* published in New York with *Library Science, with a slant to Documentation* published in Bangladore, India?

Suggestion

An interesting solution to some of the problems of error detection was mentioned by Addelston (9) at the symposium on error control in chemical literature. Dr. Fieser, author of *Topics in Organic Chemistry*, was quoted as follows:

> 'When a new book is prescribed for use in one of our courses, I offer a prize of $1.00 for each error discovered in order that the first reprinting can be corrected as fully as possible.'

Perhaps some variation on this theme for our computerized databases is in order.

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Explorers Learn To Use Computers

by Russell C. Coile, one of the National Association for Gifted Children (NAGC) members helping generally with the course who is now studying at the City University on sabbatical leave from the Center for Naval Analyses of the University of Rochester, USA.

International Computers Limited ran a special computer course for twenty NAGC Explorers from 27 to 31 August 1974 at ICL's Beaumont Customer Training Centre, Old Windsor, Berkshire. The children ranged in age from ten to 14 including one ten year old, six who were 11, two twelves, four thirteens and seven who were 14. Three of the 20 were girls. The children came from various parts of England–Bristol, Cheshire, Buckinghamshire, Nottingham, Berkshire, Hertfordshire, London, Surrey, Huntingdonshire, Worcestershire, Essex, Cornwall, Kent and Somerset. The children were typically 'top of class in maths and physics', 'always top of class in maths–now building a computer for the maths room under guidance of the Master', 'attends local Polytechnic to put programmes into computer', 'has IQ of 170', etc.

The course was under the direction of Mr John L. Hammond assisted by Mr Stephen J. Bacon, both of International Computers Limited-Computer Education in Schools. Mr Hammond was one of the ICL-CES systems team which developed the two volumes of the CES Computer Studies texts studied by the children. Both former school teachers enjoy teaching children again, since they now teach teachers.

The course began after an introductory lunch on Tuesday, 27 August. John Hammond and Steve Bacon gave each child a copy of Book 1 of the ICL-CES Computer Studies*, a template for drawing computer flowcharts, paper, pencil and eraser and then they were off. The essential material in the 282 pages of Book 1 was covered in a few hours. The children were told how computers work, how to draw a flowchart, how to write a programme using 'CESIL' which is 'Computer Education in Schools, Instructional Language,' then given blank CESIL coding sheet forms and urged to dive in. As a matter of fact, no one needed any urging and soon a number of programmes had been written.

CESIL has 14 programme instructions: ADD, DIVIDE, HALT, IN, JINEG, JIZERO, JUMP, LINE, LOAD, MULTIPLY, OUT, PRINT, STORE, and SUBTRACT. For example, a CESIL programme to calculate the average of three numbers would look like this:

```
IN
STORE FIRST
IN
ADD FIRST
STORE SUM
IN
ADD SUM
DIVIDE +3
PRINT 'AVERAGE'
OUT
HALT
```

The children then invaded the card-punching room and were shown how to punch their own cards. After supper, the children viewed a motivational film about how wonderful computers were (which was like preaching to the converted) and then were dragged reluctantly from the card-punching room or their programming desks and forced to go to bed at 10 p.m. so the ICL staff could get some rest.

No one needed to wake the children Wednesday morning as they were all anxious to get back to programming and card-punching. They sat impatiently through brief lectures on computer hardware and binary numbers waiting to get back to work. A dozen or so were persuaded to go swimming before lunch in Beaumont's indoor swimming pool and some played table tennis or croquet, but basically they disliked taking any precious moments away from computing. The recreational facilities at ICLs Beaumont Training Centre are, of course, designed for the not-quite-so-eager customer and include colour television in the lounge and a wide variety of facilities for indoor and outdoor games within the 53 acres of grounds. The possible activities include badminton, billiards, darts, squash, swimming, table tennis, croquet, putting and tennis. The library contains both technical and fiction books.

After supper, half of the children were driven to ICL's Radley House in Ealing to run their own programmes on an ICL 1904F computer while the others saw another film and carried on programming. The visitors to

Radley House soon made friends with the computer operator who had the computer showing off its tricks after all their cards had been fed in and their programmes run. The printer produced pictures of Snoopy, the Concorde, and various portraits and then the computer gave them a concert of music by J. S. Bach.

Thursday morning started with a lecture on correcting card punch errors and programming errors. The computer had printed out a list of various things wrong as it had attempted to run each of the programmes. It was a shock for the children to read the computer's harsh but helpful comments, such as:

'Unrecognisable instruction'

'Invalid identifier'

'Operand missing'

'Function missing'

'Programme requires more data'.

At 11 o'clock, John Hammond and Steve Bacon handed out copies of Book 2 of the Computer Studies series. The 406 pages on how to write programmes in 'BASIC', the Beginners' All-purpose Symbolic Instruction Code were covered by 4 p.m. BASIC is a more powerful programming language than the CESIL used to introduce the children to computing.

BASIC has 18 programme statements: DATA, DEF, DIM, END, FOR...TO, FOR...TO...STEP, GOSUB, GOTO, IF...THEN, LET, NEXT, ON...GOSUB, PRINT, READ, REM, RESTORE, RETURN, and STOP. A BASIC programme to add ten numbers would be:

```
100 LET S=O
110 FOR 1=1 TO 10
120 READ N
130 LET S=S+N
140 NEXT I
150 PRINT S
999 END
```

Instead of preparing punched cards as they did for CESIL, the children now learned how to use a teletypewriter to punch a paper tape. Next they learned how to use their paper-tape to load their BASIC programmes by means of a telephone circuit into a computer at the City of London Polytechnic which operates the ILEA Schools Timesharing Service. Finally, the moment they had been waiting for – the moment they could say,

"HELLO COMPUTER"

Actually, the computer would not deign to reply if a stranger telephoned in and said 'Hello computer,' just like that. One has to give the computer a billing identity code and a magic password after one says 'Hello' for the proper 'log on' procedure. The high point of the course for many was then this moment of using a remote access video display unit and keyboard for interactive computing–talking back and forth with a computer. This was living! Master and slave–except that the computer slave was very demanding and merciless in pointing out all errors of programming and sins of omission of data.

In retrospect, it was amazing how these children, with proper guidance, had been able to absorb so much in such a short time, About 60 programmes were written during the first two days. Lots of errors, to be sure, but correcting them was in itself educational. Most of the programmes were simple ones as the children were learning to programme, but there were a number of more ambitious ones including a simulation of the Wimbledon tennis tournament. Incidentally, the computer's random number generation had Stan Smith win.

The children were invited to turn in any comments or suggestions at the end of the course. Typical of the comments received was one that read:

'I found this course very interesting as I have no computer instruction at school. For those who already knew and understood the basics of computing, the course offered an excellent opportunity to use the facilities.

The length of four days was perhaps a day or two too short. The films were a good idea and provided both back-up information and entertainment.

I think that a more advanced course next year for this year's Explorers would be an excellent idea, and I, for one, would jump at the chance.'

As a matter of fact, during the last few minutes on Saturday morning before the final lunch, when the children realized that the course was almost over, there was a tremendous flurry of activity as addresses were exchanged, plans made for a children's computer club that might meet during school holidays if they could find a university which would let them use computing facilities, and a petition written. The petition was presented to John Hammond in a cheeky way–the children loaded their petition for a follow-up course next year into a computer at Newcastle, and then asked

John to get a particular programme. The remote access teletype terminal then printed out the petition and the names of the signers.

It is to be hoped that additional support for this type of computer project for gifted children will be forthcoming in future years. As Bryan Thwaites has pointed out in the foreword to Book 1 of the Computer Studies:

'Computers are still developing very rapidly in their scope and power, and it is very difficult for us today to imagine what their application will be in another 30 years time. It is therefore essential that the present generation of school pupils should have a firm understanding of the basic principles of computing and of the potentiality of computers so that they will be able to cope naturally with opportunities which further technical development will give to society as a whole.'

The National Association for Gifted Children is very appreciative of all of the effort of International Computers Limited to offer such a rewarding experience to a group of children.

* International Computers Limited — Computer Education in Schools. *Computer Studies, Book 1*, published by Computer Education in Schools, 322 Ellston Road, London NW1 3BD, 1973.

Professional Paper No. 205, October 1977, A Bibliometric Examination Of The Square Root Theory Of Scientific Publication Productivity

Paper presented at the annual meeting of the American Society for Information Science, Chicago, Illinois, 29 September 1977

Abstract

A postulated model of scientific productivity asserts that half of all scientific papers in a field are contributed by a few highly productive authors numbering approximately the square root of the total of scientific authors.

Available data has been examined to judge the validity of the theoretical model on the basis of empirical evidence. An analysis has been made of the data collected by pioneer bibliometrician, Alfred J. Lotka, on the frequency distribution of scientific productivity of chemists listed in *Chemical Abstracts*. The total number of chemists whose names began with letters A or B was 6,891. The 84 most productive chemists, the square root of 6,891, contributed 4,207 papers of the total of 22,839 papers, or 18 percent–considerably less than the 50 percent asserted by the model.

Additional data concerning the scientific productivity of physicists, mathematicians, biologists, computer scientists, econometricians, operations researchers, and entomologists suggests that the most productive square root of the total authors produced an average of 25 percent of the total papers. These databases had scores between 9 percent and 38 percent with one exception–a 57 percent recorded for a university physics department. Here the research-oriented bionic men published between four and eight papers per year each, while their teaching-oriented colleagues published fewer papers.

Introduction

In 1963, Price (1), asserted that half of the scientific papers are contributed by the most prolific square root of the total number of scientific authors. He returned to this subject in 1976, stating again (2) that the top $\sqrt{P}$ authors will produce at least half the total papers published by the

population P. No experimental data was presented to validate this theory. However, in a recent paper, Allison (3) stated that the validity can be judged on the basis of empirical evidence. It is the purpose of this paper, therefore, to assemble available bibliometric data on scientific productivity in order to examine this theoretical model. Price's (4) definition that 'a scientist is any person who has ever published a scientific paper' will be used in this discussion.

Empirical Data

Table I presents bibliometric data on scientific productivity for various disciplines. An effort has been made to include all familiar pre-1963 databases used by Alfred J. Lotka (5), H.A. Simon (6), W. Shockley (7), etc. as well as a number of other databases. The table contains for each referenced entry, the number of total authors, the square root of the total authors, the total papers, and the actual number of papers contributed by the most productive square root of total authors. Finally, the table gives the ratio of actual papers to total papers as a percentage. One can therefore readily compare these percentages to the postulated 50 percent predicted by the model.

Table 1. Bibliometric Data on Scientific Productivity for Various Disciplines

Chemists: 18%; Physicists: 13%; Mathematicians: 38%; Geneticists: 36%; Entomologists: 19%; Mycologists: 9%; Entomologists: 10%; Econometricians: 26%; Los Alamos Physicists: 25%; Brookhaven Physicists: 38%; Columbia U. Physicists: 57%; Statisticians: 37%; Lasers: 26%; ORSA: 12%; Information Theory: 28%.

For example, Lotka made a classical analysis of the frequency distribution of scientific productivity of chemists listed *in Chemical Abstracts, 1907 - 1916*, where he counted 6,891 total authors whose names began with letters A or B. The square root of 6,891 is 84. The most productive 84 chemists contributed 4,207 papers of the total of 22,839 papers, or 18 percent. This is considerably less than the predicted 50 percent.

Inspection of the table shows that the different batches of data give results ranging from 9 percent to 38 percent with one exception of 57 percent. The 57 percent came from the Columbia University physics department which had some extremely prolific authors who each published between four and eight papers per year for the four years of Shockley's

survey. Some of the other members of the department seem to have devoted more time to teaching and less to research and published fewer papers.

Conclusion

The overall results suggest that further research on the question of the productivity of the elite seems necessary, since the prolific authors who number the square root of the total authors do not appear to produce half of the papers.

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Dissertation submitted for the degree of Doctor of Philosophy

Bibliometric Study of Frequency Distributions of Scientific Productivity, Russell Cleven Coile, Dissertation submitted for the degree of Doctor of Philosophy from the Centre for Information Science, The City University, St. John Street, London. ECIV 4PB, August 1977.

Abstract

Statistical analysis of the productivity of scientists has been a popular topic in research on 'research' and in studies of the 'science of science' during the past fifty years. One of the measures of productivity of scientists is the number of scientific papers published in scholarly journals.

Alfred J. Lotka, a statistician, made a classic bibliometric study of scientific productivity in 1926. He analyzed the number of chemists who were listed in *Chemical Abstracts, 1907-1916*, as having published one, two, three, etc. papers. He found that approximately 58 percent of the publishing chemists had published one paper, 15 percent had published two papers, 7 percent three papers, etc. Lotka then postulated an 'inverse square law of scientific productivity.'

Lotka's approach was similar to Pareto's use of a power function to describe the distribution of income. Williams, a biologist, tried both a geometric series and Fisher's logarithmic series in a study of the publishing patterns of biologists. Simon investigated a Beta function developed by Yule. The Weibull distribution developed for use in reliability studies, and the Singh/Maddala function used in econometric studies of income have been investigated.

Empirical data on productivity of authors in various scientific disciplines has been collected. Both the Weibull and the Singh/Maddala functions were found to give better fits to the data than the other distributions tested.

A brief investigation has been undertaken of a related subject, productivity of journals. Bradford, of the Science Museum library, in 1934 studied the scattering of papers and journal productivity in his work on the efficiency of abstracting services. Vickery, Kendall, Brookes, Wilkinson, Morse, Leimkuhler and Haspers have explored different

approaches to this problem. The Singh/Maddala function may be of value here, also.

Finally, a study was undertaken of the rationalization of these different mathematical approaches. The mathematical relationships have been explored and a number of interesting aspects uncovered. The Singh/ Maddala function is related to the Weibull, the Pareto, the Lotka, and Simon's Yule distribution.

Introduction

One of the interesting problems in information science is the question of productivity of scientific papers. How many papers might a chemist, physicist, mathematician, biologist, etc., publish during his or her professional lifetime? This question is a pertinent one for editors of scientific and technical journals, managers of abstract services, librarians and information scientists who work with journals, and to fellow chemists or physicists, etc., in their research laboratories.

Various studies of scientific productivity have been conducted over the years. Initially, it was fashionable to count the number of papers written by great men. Dennis (1), for example, examined the Biographical Memoirs of the U. S. National Academy of Sciences for data on publications of famous scientists. For example, Professor Arthur E. Kennelly of Harvard who discovered the 'Kennelly-Heaviside' ionospheric layers, published 362 papers or about 9 per year over a 40 year period.

However awe inspiring these publication rates of the greatest men of science are, the publication rate of the average scientist is equally interesting. How many scientists publish? Of those who do publish, many scientists seem to have published approximately 0.1 papers per year as illustrated by a sample of scientific productivity data for chemists, mathematicians, biologists, etc., given in Table 1.

Table 1 Bibliometric Data On Scientific Productivity (data sources are shown in table 5)

Field	Authors	Papers	Years of Survey	Percent One Paper	Papers per Author/Yr.
Chemistry	6,891	22,939	10	58	0.33
Mathematics	278	1,124	25	48	0.16
Fluidics	401	529	9	69	0.15
Genetics	826	3,662	33	51	0.13
Econometrics	721	1,759	20	60	0.12
Operations Research	787	1,167	15	67	0.10
Computer Science	420	383	10	83	0.09
Biology	130	264	28	59	0.07

A related problem in information science is the determination of the scatter of papers in a specialized field over a number of journals. Which journals (like authors) are the more productive?

Is it possible to find frequency distributions which will provide a reasonable fit to various collections of empirical bibliometric data? Will these frequency distributions be versatile enough to be applicable to different scientific disciplines?

The approach here has been to examine some of the theoretical models which have been proposed during the past fifty years, test their validity against a variety of data from different disciplines and attempt to find relationships, if any, among these models.

Chapter I will be a brief historical survey of research conducted during the past fifty years on this question of frequency distributions of scientific productivity. Details of the various historical studies will be found in Appendices.

Chapter II will examine the mathematical relationships, if any, among these different theoretical approaches.

Chapter III will discuss the methodology used for comparing the goodness-of-fit of the different theoretical distributions with data from different disciplines.

Chapter IV will present the results of these tests and discussion while Chapter V will summarize the conclusions.

Chapter I Investigation Of Scientific Productivity

Lotka

One of the pioneers in bibliometric studies of scientific productivity was Alfred J. Lotka (2) who published a classic paper in the Journal of the Washington Academy of Science. His paper on frequency distribution of scientific productivity presented an analysis of the number of chemists who were listed *in Chemical Abstracts, 1907-1916*, as having published one, two, three, etc., papers. Table 2 shows his data for the senior-author chemists whose names began with the letters A and B. Figure 1 illustrates the percent of authors with various numbers of abstracts. Figure 2 is Lotka's log-log plot of this data showing that, of all chemists who had published, approximately 58 percent published only one paper. The slope of the line was about -1.9. Lotka then used a Pareto-type (3), power function to estimate the percent authors, f, of n papers. (Equation 1)

Lotka also examined Auerbach's (4) data for publications of physicists and found a slope of about -2.0. Lotka therefore proposed an 'inverse square law of scientific productivity' for chemists and physicists, equation (2) where f is the frequency (in percent) of authors who publish n number of papers. Details are given in Appendices A and B.

Table 2. Frequency Distribution of Authors In Chemical Abstracts, 1907 – 1916

Abstracts	A& B Chemists	% Authors
1	3,991	57.92
2	1,059	15.37
3	493	7.15
4	287	4.16
5	184	2.67
6	131	1.90
.	.	.
.	.	.
.	.	.
346	1	0.01
	6,891	

Figure 1 Percent Authors With a Given Number of Abstracts
Data From *Chemical Abstracts 1907-1916*

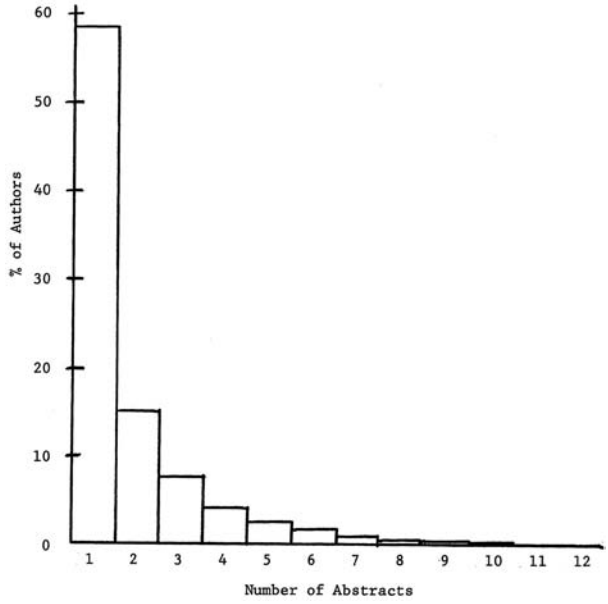
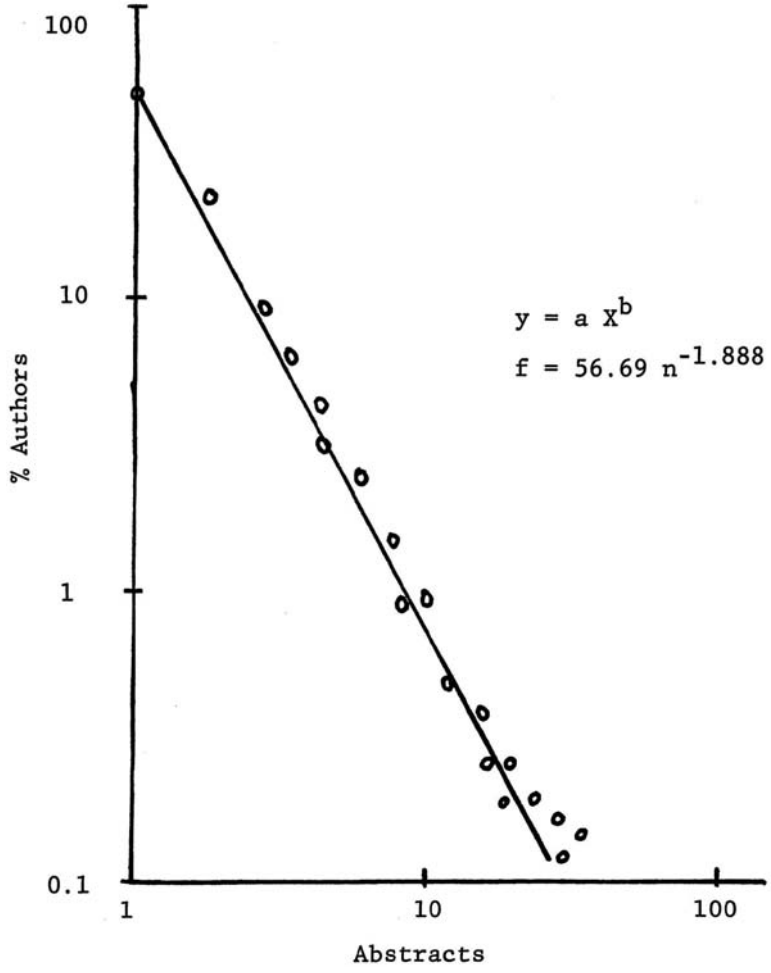


Figure 2 Percent Authors Versus Abstracts Data From *Chemical Abstracts 1907-1916*



$$f = 56.69\ n^{-1.888} \tag{1}$$

$$f = \left(\frac{600}{\pi^2}\right)\frac{1}{n^2} \tag{2}$$

$$log\ y = 3.74877 - 2.11012\ log\ x \tag{3}$$

$$n_1,\ n_1x,\ n_1x^2,\ \text{etc.} \tag{4}$$

$$n_1 = \frac{S^2}{N} \tag{5}$$

$$x = \frac{(N-S)}{N} \tag{6}$$

$$n_1,\ \frac{n_1x}{2},\ \frac{n_1x^2}{3},\ \frac{n_1x^3}{4},\ \text{etc.} \tag{7}$$

$$S = \frac{n_1}{x}\,(-ln(1-x)) \tag{8}$$

$$N = \frac{n_1}{1-x} \tag{9}$$

$$f(i) = AB(i, \rho+1) \tag{10}$$

$$B(i,\rho+1) = \int_0^1 \lambda^{i-1}(1-\lambda^\rho)d\lambda \tag{11}$$

$$= \frac{\Gamma(i)\ \Gamma(\rho+1)}{\Gamma(i+\rho+1)} \quad (0 < i,\ 0 < \rho < \infty)$$

$$\frac{(1-\alpha)\ (i-1)}{1+(1-\alpha)\ i} = \frac{f^*(i)}{f^*(i-1)} \qquad \text{(i=2, \ldots k)} \tag{12}$$

$$f^*(1) = \frac{k\alpha}{2-\alpha} = \frac{n_k}{2-\alpha} \tag{13}$$

where n_k = total authors

k = total papers

$$\alpha = \frac{n_k}{k}$$

$$\rho = \frac{1}{1-\alpha}$$

$$N = \frac{ak}{p(a+p)} \tag{14}$$

$$F(X) = \frac{log(1+\beta x)}{log(1+\beta)} \tag{15}$$

$$R(n) = k\ log\left(\frac{n}{s}\right) \tag{16}$$

$$a(r+0.55)^{-3.5} \tag{17}$$

$$f(n) \simeq \frac{0.668680}{n^2} - \frac{0.003256}{n^3} - \frac{0.129884}{n^4} \tag{18}$$

$$(\text{for n } > 6)$$

$$f(n) \approx \frac{1}{\beta n^2} - \frac{0.00487}{\beta n^3} - \frac{0.19424}{\beta n^4} \tag{19}$$

$$\text{where } \beta = 1.495483$$

$$F(x) = 1 - e^{\frac{-(x-c)^\beta}{A}} \tag{20}$$

$$f^*(n) = (m+1)\ B\ (n, m+2) \tag{21}$$

$$F(x) = 1 - \frac{1}{(1+a_1 x^{a_2})^{a_3}} \tag{22}$$

$$R(n) = h\ log\left(\frac{n}{u} + 1\right) + R(0) \quad \text{for n} > 0 \tag{23}$$

Bradford

The librarian of the Science Museum, London, Samuel C. Bradford, (5), (6), Appendix C, was concerned with problems of abstracting services. In the course of his research, he asked E. Lancaster Jones, also of the Science Library, to study the distribution or scatter of papers in applied geophysics and lubrication, over various journals. Bradford found that there were a few very productive journals, a larger number of journals with a moderate number of papers, and a still larger number of journals with only a few papers relevant to the specific topic. He plotted the running total of papers as a function of the logarithm of the running total of the corresponding journals ranked in order of productivity and found a fairly straight line, apart from the papers produced by the first group of large producers. He plotted Lancaster Jones' data for applied geophysics and lubrication and stated several times that the 'running total' or 'aggregate' of references

(papers) was proportional to the logarithm of the corresponding number of sources. Unfortunately, he restated in one sentence his law of distribution of papers on a given subject in scientific periodicals using the words 'the number of periodicals' instead of writing explicitly 'the running total of numbers of periodicals.' Vickery (7), Leimkuhler (8), and Wilkinson (9), (10), have taken this one sentence and developed a different interpretation of Bradford's law from that of Brookes (11).

Davis

Harold T. Davis (12), Appendix D, examined Dresden's (13) data on scientific productivity of mathematicians and Lotka's (2) data on chemists and physicists in an effort to find statistical support for a 'Pareto law' version of a general law of inequality. He fitted a curve (equation 3) where y is the number of persons contributing at least x contributions, to Arnold Dresden's data on 278 mathematicians who wrote 1,102 papers during a 25-year period in Chicago. However, the slope of -2.11 is larger than the usual -1.5 associated with the Pareto law.

Williams

C. B. Williams (14), Appendix E, of the Rothamsted Experimental Station proposed a geometric series to estimate the number of biologists publishing one paper, two papers, etc. This series is equation 4. If N is the total number of papers and S is the total number of authors, nl and x are determined from the expressions in equations 5 and 6.

Fisher

C. B. Williams (14), Appendix F, also examined the logarithmic series first suggested by Sir Ronald A. Fisher (15) in biological research on the frequency of butterfly species on the Malayan peninsula. The series is equation 7, where n_1 is the number of authors publishing one paper and x is a constant less than unity. If the total number of authors is S and the total number of papers is N, then n_1 and x can be determined from equations 8 and 9.

Simon

Herbert A. Simon (16), Appendix G, proposed a distribution function for scientific publications which he called the 'Yule' function because of prior research by G. Udny Yule (17). Yule had developed a Beta-function

probability model for the frequency distribution of biological genera. This 'Yule' function is equation 10, where A and rho are constants and B (i, rho+l) is the Beta function of equation 11.

Simon derived the estimated frequencies from his equations (2.11) and (2.21) which are equations 12 and 13.

Shockley

William Shockley (18), Appendix H, studied the scientific productivity of physicists at the National Bureau of Standards, Brookhaven National Laboratory, the Physics Department of Columbia University and the Los Alamos Scientific Laboratory. He felt that his graphs of cumulative distribution of number of publications on a logarithmic scale indicated more or less normal distribution of the logarithm of rate of publication, i.e., a 'log-normal' distribution. However, he described some of these log- normal fits as 'very jumpy.'

Kendall

M. G. Kendall (19) examined a bibliography of operational research which gave data on 1,763 papers published in 370 journals. He found that the cumulative sum of papers plotted as a function of the logarithm of the sum of ranked journals was almost linear and in fact better than Bradford's own examples. He discussed the relationship between Simon's Yule distribution and the Bradford-type distribution and Zipf's law.

Price

Derek J. de Solla Price (20), Appendix I, felt that Lotka's inverse square law of scientific productivity needed modification and proposed a distribution of the Pareto type (equation 14), where N is the number of men who published 'at least' p scientific papers within a given interval of time and a and k are constants.

Mantell

Leroy H. Mantell (21), Appendix J, proposed the use of the Poisson distribution, with the zero frequency supplied, to estimate the number of contributions per author. He was concerned about estimating the number of authors who did not publish and used Cohen's (22) technique to estimate the number of noncontributors.

Leimkuhler

Professor Leimkuhler (8), of Purdue University derived an interpretation of Bradford's law of equation 15, where F(X) is the proportion of total productivity of papers in a fraction X of journals where beta is N/t where N is total number of journals and t is a constant.

Brookes

B. C. Brookes (11), of University College, London, developed an interpretation of Bradford's law of equation 16, where k = N, the total number of journals and s is a constant. Wilkinson, (10), compared these two formulations with several sets of data and found that Brookes' formulation, in general, gave a better fit to the data than did Leimkuhler's formula.

Voos

H. Voos, (23), Appendix K, proposed the use of Lotka's power function for bibliometric studies of scientific productivity of different disciplines. He found that Lotka's exponent of -2 for physicists was approximately -3.5 for information scientists.

Kochen

Manfred Kochen, (24), Appendix L, studied the publications of a sample of authors at the IBM Research Center and stated that the number of people who authored exactly r papers during a given time period varied approximately as equation 17. Unfortunately, no further information was given as to the value of 'a' or the length of the time period.

Morse

Professor P. M. Morse (25) of M.I.T. has derived an approximate formula for the Bradford probability density function f(n) which is equation 18, and has published a table of computer-generated values of f(n) and F(n), the cumulative distribution function. Leimkuhler (26) has proposed a similar model in equation 19.

Weibull

Professor Waloddi Weibull (27) (28), Appendix M, of the Royal Institute of Technology, Stockholm, has proposed a powerful statistical distribution function of wide applicability.

The Weibull cumulative distribution function is equation 20, where F(x) is the cumulative fraction of authors publishing x papers; A is a scale parameter; B is a shape parameter; and C is a location parameter. The Weibull function has been examined for its applicability to describe the frequency distribution of scientific productivity.

Price

Derek de Solla Price (29) proposed calling Simon's 'Yule' function, the 'Cumulative Advantage Distribution.' He stated:

> 'In particular, this is shown to be an appropriate underlying probabilistic theory for the Bradford Law, the Lotka Law, the Pareto, and Zipf Distributions, and for all the empirical results of citation frequency analysis. As side results one may derive also the obsolescence factor for literature use. The Beta Function is particularly elegant for these manifold purposes because it yields both the actual and the cumulative distributions in simple form, and contains a limiting case of an inverse square law to which many empirical distributions conform.'

Price gives his Cumulative Advantage Distribution as equation 21, where f(n) is the fraction of a population of P individuals (e.g., authors) in state n (e.g., papers) and m is a parameter which Price stated to be 0, or 1, or 0.7 at various places in his paper.

Singh/Maddala

S. K. Singh and G. S. Maddala, (30), Appendix O, derived a distribution that is a generalization of the Pareto distribution and the Weibull distribution. This new distribution was developed during econometric research on the size distribution of incomes. This econometric function has been examined for its applicability to frequency distributions of both author and journal productivity. The Singh/Maddala cumulative distribution function is equation 22, where F(x) is the cumulative fraction of authors publishing x papers and a_1, a_2, and a_3 are parameters.

Haspers

Jan H. Haspers, (31), of the Delft University of Technology, has proposed a generalization of Brookes' and Leimkuhler's formulation of Bradford's law, equation 23, where h and u are constants.

Chapter II Frequency Distributions and Their Relationships

> 'An elephant is like a wall,' said the first blind man. 'A wall?' said the second blind man. 'You're wrong. An elephant is like a snake.' 'A snake?' said the third blind man. 'You're wrong. An elephant is like a spear.' 'A spear?' said the fourth blind man. 'You're wrong. An elephant is like a tree.' 'A tree?' said the fifth blind man. 'You're wrong. An elephant is like a fan.' 'A fan?' said the sixth blind man. 'You're wrong. An elephant is like a rope.'
>
> From an old tale from the land of India. *The Blind Men and the Elephant.* Retold by Lillian Quiqley. New York, Charles Scribner's Sons, 1959.

The various approaches used by different individuals in conducting research on the question of productivity of scientific publications as briefly outlined in Chapter I reminds one of this old tale.

Some approaches used cumulative frequency distributions while others used probability density functions. Some used discrete distributions while others used continuous distributions. Some researchers concentrated on the high producers, while other researchers started at the other end and studied those who produced one publication. Some research was concerned with productivity of individuals while other research was concerned with productivity of journals. Still other research has been carried out on the productivity of papers as measured by citations.

Figure 3 illustrates some of the important participants in research on scientific productivity. Several major avenues of approach are shown and their relationships. The Singh/Maddala's econometric model is based on the Weibull distribution and Pareto's law. Lotka's law, based on Pareto's law, was one of the earliest efforts to study the frequency distributions of publishing of chemists and physicists. Zipf spent twenty years collecting examples of Pareto's law applied to different problems. Simon applied

Yule's Beta function to publication productivity. Price rediscovered Simon's work twenty years later.

Meanwhile, Bradford started a chain of research efforts on the scattering of papers in journals. Vickery, Brookes, Kendall, Wilkinson, Haspers, Morse, and Leimkuhler, have worked on various interpretations of or alternatives to Bradford's original ideas.

This chapter contains a detailed mathematical analysis of the relationships among these different theoretical models.

Figure 4 summarizes the principal formulations. Detailed analyses of the following links will be presented and Figures 3 and 4 can be used as if they were road maps. The links are: Pareto — Weibull; Pareto and Weibull — Singh/Maddala; Singh/Maddala — Burr; Weibull - Dubey's Weibull — Gamma; Dubey's Weibull — Gamma — Burr; Pareto — Auerbach; Auerbach — Lotka; Pareto — Willis; Pareto, Auerbach, Willis, Lotka — Zipf; Willis — Yule — Simon; Simon — Fisher — Williams; Simon — Price; Bradford — Kendall — Simon; Bradford — Brookes; Bradford — Vickery — Wilkinson; Bradford — Vickery — Leimkuhler; Leimkuhler — Cole; Leimkuhler — Zipf; Brookes — Wilkinson — Haspers; Bradford — Morse Leimkuhler — Morse.

Conclusions

The question of how many scientific papers a scientist might publish over a period of time has intrigued a number of investigators. Lotka made a statistical study of the publishing productivity of chemists and published his analysis in 1926. After also examining publishing patterns of physicists, he proposed his 'inverse square law of scientific productivity' based on a Pareto-type power function.

Other researchers have attempted to find frequency distributions that fit the collection of empirical data gathered on the publishing habits of various disciplines. An early worker was Williams, a biologist, who examined both a geometric series and Fisher's logarithmic series which had been found useful in biological research. He analyzed the fit of these distributions to publications of biologists.

Simon found that a Beta function developed by Yule many years ago for research on evolution seemed to provide a rough fit to publishing data of mathematicians, chemists, physicists and econometricians. Both Simon and Lotka examined several scientific disciplines.

Various other distributions such as the lognormal and Poisson have been suggested. However, a search for more powerful frequency distributions that

might provide a better fit to a number of scientific disciplines has found two such distributions, the Weibull and the Singh/Maddala. The Weibull distribution has been used in research on reliability while the Singh/Maddala function was developed to describe the distribution of income in the United States. Both of these distributions have been tested as their applicability to frequencies of publications.

The bibliometric research described here has included a search for statistical frequency distributions which might be of value in describing the frequency distributions of scientific productivity. These functions have then been tested for goodness-of-fit against 26 collections of data from a variety of scientific disciplines. The Weibull distribution and the Singh/Maddala econometric function were found to fit all of the different data collections. The Kolmogorov-Smirnov goodness-of-fit test was used to test the functions.

None of the other functions that have been suggested fit even half of the different data collections used for these tests. Lotka's inverse square law fit only 8 of the 26 collection of data or 31%. The geometric series suggested by Williams fit 7 of 19 collection or 37%. Fisher's logarithmic series fit 8 of 19 cases or 42%, while Simon's Yule distribution fit 8 of 18 cases or 44%. The Poisson distribution fit 3 of the 19 collections or 16%.

It is interesting that frequency distributions of those tested which show the best indication of applicability to a number of different scientific fields are the Weibull distribution and the Singh/Maddala distribution.

It is also of interest that Lotka's Inverse Square Law which is the most famous distribution ever suggested for scientific productivity produces a fit in only about a third of the collections of data examined. It is surprising to learn that Lotka's inverse square law is actually of such limited applicability. If Lotka had looked closely at the original data for chemists in the *1907-1916 Chemical Abstracts*, it would have been apparent, if he had used a goodness-of-fit test, that his inverse square law did not really fit chemists in a statistical sense.

Both the Weibull and Singh/Maddala functions contain three parameters. This may be the principal reason for the ability of these functions to obtain a better fit than any of the other functions. It has not been possible thus far to distinguish any particular values of the three parameters which might be associated with a discipline. Originally, it was felt that consistent set of values of the three parameters might emerge associated with chemists and

perhaps a different set associated with mathematicians, etc. Perhaps the number of data bases investigated thus far has been too small for any such pattern to be revealed.

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THE CITY UNIVERSITY

LONDON

DEGREE of DOCTOR OF PHILOSOPHY

We hereby certify that

Russell Cleven Cole

having undertaken an approved course of research in the University during the years 1973 to 1977, satisfied the examiners and was admitted by resolution of the Senate to the Degree of Doctor of Philosophy in Information Science, on the 25th day of January, 1978

E.W. Parkes

Vice-Chancellor

Head of Department

Academic Registrar

Chapter 8
Operations Analyst Ketron, Inc – 1978 to 1981

I worked in the Operations Evaluation Group from 1947 to 1978. The Group had been financially supported by Office of Naval Research grants to MIT's Division of Sponsored Research 1947-1962, Franklin Institute of Philadelphia 1962-1967, and University of Rochester 1967 – 1981.

I resigned from the University of Rochester in 1978 and joined 25 other OEG folks who had already resigned to go to work across the street for a small company called Ketron. We were all unhappy with the way the University of Rochester was administering its Office of Naval Research grant. Actually ONR was also unhappy and gave Ketron some funding to carry on the research we had been doing on the University of Rochester grant. As it turned out, ONR became even more unhappy and within three years cancelled its grant to Rochester in 1981 on the advice of the Navy's Scientific Board. The Board recommended that a non-profit federally funded research and development center—the Center for Naval Analyses—be established for the U.S. Navy. This has evolved over the years into the CNA Corporation in Alexandria, Virginia, which administers both the Center for Naval Analyses and a new Institute for Public Research. The Operations Evaluation Group survived and is in the Center for Naval Analyses.

John Dunster Kettelle studied physics at Harvard, joined the Navy and was in amphibious operations during World War II and on a submarine in the Korean War. He did graduate work in 1946-1948 in mathematics at Brown and was awarded the Sc.M in 1949. He went into partnership in 1957 with Daniel Wagner, a mathematician who was also in the graduate school at Brown. Wagner received his Ph.D in 1951. They ended their

partnership after five years and each established a company. John Kettelle called his company Ketron.

Ketron started in Philadelphia but soon established a branch in Virginia to be nearer to the Navy and Marine Corps. There were about 100 people on the scientific staff when I joined. The Washington Metro subway system was under construction and John had leased the 22nd and 23rd floors of a building which contained the Rosslyn station at the Virginia end of the Key Bridge in the first basement level of the building. John leased the entire 22nd floor to some company which more than paid for his long term lease for two floors.

A couple of projects that I worked on while at Ketron were training employees for possible future disasters in a new subway system, and a contract Ketron received from the Brazilian Navy.

Washington D.C decided to build a subway system which in part drew on the experience of the City of San Francisco, California in building its subway system. The San Francisco Bay Area Rapid Transit (BART) and communities it served were not prepared for disasters on January 17, 1979. A subway train en-route from Oakland to San Francisco in a tunnel under the Bay caught fire. Almost everything that could go wrong did go wrong. The Oakland Fire Department sent fire engines to the wrong location. The tunnel's ventilation system which was supposed to clear smoke from the fire area was improperly operated, making the smoke worse, not better. The subway cars had been built with seats made of polyurethane, a highly flammable plastic which emits toxic fumes when ignited. Firefighters had to contend with dense black smoke. The communications system was found to be inadequate. The BART dispatcher sent two trains loaded with passengers into the tube while the fire was still raging. It took firefighters seven hours to control the fire. The California Public Utilities Commission forced BART to close the tube for eleven weeks resulting in a loss of $5 million in revenue.

Fortunately, a BART supervisor who just happened to be on board the train, was able to take charge of the 40 passengers

and lead them to the front car of the seven car train where they were rescued. BART has since replaced the flammable seats in all trains, posted placards in each subway car telling passengers what to do in emergencies just as airlines do in preflight safety briefings, conducted evacuation drills from the tube, and drafted written agreements with the San Francisco and Oakland Fire Departments establishing exact lines of communications and command in emergencies, etc. Washington Metro officials had greatly strengthened their planning for fire emergencies after being alerted by the San Francisco BART fire. In fact, Washington bought its subway cars from the same factory in Italy where San Francisco bought its cars, and had them delivered with the new nonflammable seats and all the other San Francisco safety features.

However, there are numerous other hazards which can result in disasters for a subway system. These can result from natural hazards, machinery failures, or human factors. As far as natural hazards, we still have a long way to go in understanding and predicting hazards such as earthquakes, tornadoes, hurricanes and floods. We still have difficulties in forecasting rain, snow, sleet, hail, freezing, and heat waves which could lead to disasters.

Machinery failures, reliability, and maintainability problems plague all elements of American society from the homemaker with a malfunctioning toaster, to her husband with his car which won't start in the morning when he needs to drive to work, to the Washington Metro system. The subway system needs to prepare for the following types of failures which could lead to disasters: Computer failures, electrical power outages, mechanical breakdown of subway cars, electrical breakdown of subway cars, ventilation system failures in either cars or tunnels, communications failures, and derailment of cars.

Human factors may under certain circumstances lead to disasters. Illness of train drivers, the possibilities of crimes being committed on trains or in stations such as robbery, rape, or murder, fights, suicides, drunkenness, vandalism, strikes,

sabotage, terrorism and civil disturbances. With increasing passenger traffic, Metro Security personnel must be prepared for riots and panic. Panic is perhaps the most dangerous threat. Panic can easily result in a crowded subway train if there is a fire and electrical failure, filling the dark cars with smoke and fumes, with no one in authority to calm the crowd and restore order.

There were a number of disaster incidents in the first year of subway operations which should have alerted the Metro system management to the importance of taking some disaster preparedness actions. For example:

"Three days without a Subway" (All subway trains were left outside one night when eight inches of snow fell and the cars couldn't get inside to the tunnels the next morning The Federal government closed for three days) *Washington Post*, February 26, 1979

"Fire in Metro car at Foggy Bottom Disrupts Service," *Washington Post*, March 23, 1979.

"Blue Line Derails at Airport," *Washington Post,* June 21, 1979.

"Delay in removing ill Passenger Stalls Blue and Orange Lines traffic," *Washington Post,* December 4, 1979.

Ketron proposed a study of possible hazards leading to a series of training "war game seminars" for Metro employees, including management. This would build confidence in the transit system and the riding public. A Ketron consultant, Rear Admiral Don Engen, USN (Retired) worked on the draft of this proposal with me. He was appointed the Administrator of the Federal Aviation Administration by congress about this time, so the proposal was never given to the Washington Metropolitan Area Transit Authority, because I was being sent by Ketron to Brazil for a year.

The phone on my desk rang. I picked it up and said, "Coile, here." The voice on the other end of the line said, "Russell, would you come to my office, please." "Certainly," I answered. It was Ketron's Vice-president whose voice I had naturally recognized. *I wonder what this is all about*,

I thought as I walked down the hall. Ross Thackery was a physicist, a Rhodes Scholar at Oxford, and had retired from an Operations Research career in U.S. Air Force headquarters in the Pentagon.

"Please help yourself to a cup of coffee and make yourself comfortable," Ross began. I wondered what this was going to lead up to. "How would you like to go to Brazil?" he asked. "Would you tell me something about it? I don't know how to speak Portuguese." I replied. "Oh, you won't have any language problems. The job is for a year in Rio de Janeiro at the Brazilian Navy's Operations Research Unit. The Commanding Officer, Commander Braga and his executive officer are both graduates of the two-year Operations Research masters course at the U.S. Naval Postgraduate School at Monterey, California. They both speak excellent English."

"I'll have to ask Ellen," I said. "We have only returned from England two years ago. We had been away from our home in Bethesda, Maryland for four years. I was in Naples, Italy for a year, two years in London on the staff of Commander in Chief U.S. Naval Forces, Europe, and then a sabbatical year working on my Ph.D at The City University, London."

I went home and told Ellen all about the possible year in Brazil. "No, No, a thousand times, No," she said. She meant it. The next day, I reported to Ross that Ellen had said, "Forget it." Ross didn't give up. Ketron had already signed a contract with the Brazilian Navy's representative at the Brazilian Embassy to produce two people in Rio on January 2, 1980 for a year. I was flattered that Ross considered me the most qualified person in Ketron to be on my own five thousand miles away for a year. However it would not be all peaches and cream. The Brazilian Naval Officers had insisted that a retired U.S. Naval Officer be in charge of our two-man group no matter how good I (the technical person actually doing the research) was. It was just my luck that an officer who had been Chief of Staff of the U.S. Seventh Fleet in the Pacific had just retired. On paper, he had the background that the Brazilians thought they needed, although I found him to be more of a

bureaucrat than an analyst. I thought that it was interesting that this officer's wife refused to come to Brazil with him. She preferred to live in San Diego with their dog.

Ross and his wife invited Ellen and me to dinner at a very expensive restaurant and turned on the charm. I had suggested to Ellen that she write down all the pros and cons of going. She ended up with one reason to go (make new friends) and 29 reasons not to go. Anyway, we decided to go and they promised to send Andrew, our son down to Rio to visit us during his school vacation. Ross also agreed to pay for excess baggage on Varig, the Brazilian airplane we had to fly on from Miami to Rio. The Brazilian customs folks had all sorts of restrictions as to electronics, etc that visitors could not bring into Brazil. We didn't consider ourselves visitors (after all we would be there a year – we were not going to go just for Carnival or to see a football game with Pele, the world's greatest soccer player). We had 13 pieces of luggage, including Ellen's sewing machine in a carry-on (read stagger-on) bag.

Now, why were we there? What was this contract with the Brazilian Navy all about? First, a history lesson. The US Navy had a Naval mission in Brazil since early in World War II. A division of Brazilian Army infantry had fought in Europe with American and British troops. The US Navy had given the Brazilian Navy a dozen destroyers and other ships. The Naval mission maintained the ships. President Carter made a speech one day about the terrible things going on in Argentina where more than 12,000 people had disappeared when the Argentinean Military dictatorship decided these people threatened their rule. President Carter mentioned Brazil and talked about how the Brazilian Military dictatorship had also put political opponents in prison. The Brazilian Army General who had taken over the government in a military coup had put about 50 people in prison, but no one had disappeared or been murdered. The Brazilians were upset that they had been lumped together with the really bad Argentineans and told the US Naval Mission to go back to the United States.

Several years later, the Brazilian Navy went to the President and told him that that they could not get spare parts any more from the U.S. to maintain their ancient destroyers. The President then told them that he would arrange to budget for six new frigates. The Brazilians sent a purchasing team to Europe to talk to shipbuilders in Germany, France, Italy, and England. They finally decided to give a contract to Vosper Thorneycroft in England for six frigates. These would be similar to Royal Navy frigates but with modifications for more air conditioning for operation in the tropics in Brazil. The first two frigates would be built in England and then blueprints and a team of Vosper Thorneycroft engineers and technical advisors would be sent to Brazil so that the other four frigates would be built by a shipyard in Brazil.

When we arrived in Rio we stayed for a week in *Le Meridien Copacabana*, the tallest five star hotel in Copacabana while we looked for an apartment. We had a stroke of luck in that one of the British engineers was going back to England for a month and he offered to rent his furnished apartment to us for this month. During the month, one of the retired Brazilian naval officers working in the Operation Research Office found us a small apartment in Urca, an older part of Rio at the base of Sugarloaf Mountain on Rio's harbor. The apartment house was only four stories high with two apartments on each floor. We lived on the third floor which had a balcony facing the harbor. We were only two hundred yards from the Rio Yacht Club and there were more than 200 yachts at moorings in front of us.

Unfurnished apartments in Rio are exactly that — unfurnished with two wires sticking out of the ceiling where a fixture should be. We had a tutor twice a week for the year we were in Brazil but Portuguese came slowly. Ellen became very proficient in pointing and holding up two fingers to buy things. She found one clerk (from Mozambique) in the largest department store in Rio who spoke English and she would seek him out to help her buy things. First she bought a king size bed. We slept on the bed, ate our meals on the bed, read

books and wrote letters on the bed, etc. She finally got the rest of the furniture delivered. It was all antique—dining table with chairs, big sofa and chairs for the living room. Everything was hand carved as if by slaves and the wood was jacaranda which was used by the slaves to make church pews.

The Operations Research Office was only three blocks away – easy walking distance. Ellen would walk with me each morning after our breakfast and then go to a little grocery store to buy a plastic bag of milk – milk didn't come in bottles. Ellen and I faced living for 12-months in a strange city with the handicap of not being fluent in Portuguese. Fortunately there were lots of British people working in Brazil. There actually was a British Club which we joined. They gave a theatrical performance once a month which was hilarious. There were several people who had acted in London theaters or on the BBC years ago, and even one graduate of the Royal School of Dramatic Art, Bloomsbury, London. They were so talented that without any rehearsals they would put on a play, each just holding a copy of the dialog and stage directions. For costumes, they were masters of improvisation. The "soldiers" wore a helmet (a colander). The Club had a library where one could take out books (in English). We met some interesting English and Scottish people. An American who had lived in Rio for some years owned a 40-foot sloop and invited me to go sailing with him a number of Saturdays when he needed a crew. When he got a tear in a sail, Ellen agreed to mend it for him. The sail was canvas and so heavy Ellen couldn't lift it. He had her go to the Yacht Club and mend the sail there. She had a sailmakers palm, for pushing the needle through the thick fabric, and special heavy needles to do the job properly.

Ellen and I went every Sunday to the Friends Meeting of Rio. There were a few British and American Quakers in Brazil. Brazil has more Catholics than any country in the world, but most of the Priests were Irish, Belgian, or from somewhere. There were a number of missionaries from American evangelical faiths. Ellen would prepare a lunch which we would eat in the Botanical Gardens on our walk

home. The Emperor of Brazil visited Philadelphia during the 1876 celebrations and was very impressed by the parks he saw. When he returned to Brazil he built a Royal Botanical Garden of 2,000 acres right in Rio. He had plants, flowers and trees imported from all over the world for his Garden. He also had a zoo with a variety of animals imported from all over. When we were in Brazil in 1980, the garden had hundreds of homeless people living there. They had killed and eaten all of the animals in the zoo and anything edible growing, like coffee for example. Among our other simple pleasures, we would stop in a small park a block from our apartment to watch ants. These were leaf-cutting ants that would come out of their nest in the ground near a tree, climb the tree to a height of ten feet or more, cut a leaf, and then carry this sail-like piece of leaf back down the tree to their nest. They did all of this in single file and it was amazing how each ant would sort of shake hands with the ants he or she met as if to ask "Am I on the correct path?" "Thanks, partner."

We met some Quakers who worked for the United Nations who lived in Brasilia, the new Capitol of Brazil. They insisted we come and visit them for a weekend. We made arrangements to fly – it is about 700 miles from Rio in the direction of nowhere. The joke among Rio folks is that a gift from heaven would be a round trip ticket from Brasilia to Rio. About 1956, the President of Brazil suddenly decided to build a new capitol city in the middle of nowhere within four years. He told all the foreign embassies that each would be given 20-acres and they must build and move there or he would cut off diplomatic relations with their country. The United States was upset. They had just spent several years building the largest American Embassy in the World in Rio, which would soon become the largest American Consulate in the world.

Juscelino Kubitscheck, the president had two architects, Lucio Costa and Oscar Niemeyer and the three of them made all decisions. The Capitol was built to have perhaps 500,000 residents now, but everything was built for the estimated population of 100 years in the future. The government office

buildings were all in one area, all residential apartment buildings in another area, all shops in a special area, all sports fields and a giant swimming pool with a wave making machine in another area, all embassies in an area. The poor people who were servants, clerks, cooks, mechanics. etc lived in "satellite" towns 13 miles away just out of sight. All areas were connected by ten lane highways. The cement and construction materials were flown in by aircraft because initially there were no roads from nowhere down to Rio. The United Nations folks all hated being there.

I had an interesting professional year in Rio. The first two frigates, *Defensora* and *Niteroi* were being used to train the officers and enlisted men who would man the six frigates. However, they were having a variety of maintenance problems. In retrospect, it would have been prudent to take the money given to the Navy and buy five ships and 20 years worth of spare parts instead of what they did which was to buy six ships and thus had no money for spare parts. I wrote 19 research memoranda (in English) to Commander Braga. All of his dozen analysts were mathematicians, physicists, statisticians, or engineers. They had graduated from Brazilian universities but most of their textbooks had been in English. With help from my tutor, I had learned enough technical Portuguese to understand the memos they would write back to me. One of my projects was to analyze why there were so many failures of the 1-kilowatt ship-to-shore radio transmitter. I found that their preventive maintenance routines were actually causing most of the failures. They would turn the transmitter on for two hours each day to warm the components and prevent tropical mold, etc. However this on-off procedure was apparently causing thermal shock which caused components to fail. I recommended that they adopt US Navy policies – turn the equipment on the day before going to sea for ten days and leave it on all the time until the ship is back in port.

Planning For Mass Transit System Emergencies

Paper for the ORSA/TIMS Joint National Meeting, October 23-26, 1988, Denver, Colorado

Abstract

Appropriate planning for emergencies for mass transit systems is a classic case of technology transfer of military operations research techniques to a similar type problem in the civilian public sector. Gaming disasters such as floods, computer failures and use of drugs by operating personnel should be cost-effective.

'Three Days Without A Subway' *Washington Post*, February 26, 1979

'Fire In Metro Car At Foggy Bottom Disrupts Service' *Washington Post,* March 23, 1979

'Blue Line Derails At Airport' *Washington Post,* June 21, 1979

'Delay In Removing Ill Passenger Stalls Blue, Orange Line Traffic' *Washington Post,* December 4, 1979

'Metrorail, Busses Suffer From Cold' *Washington Post,* December 23, 1980

Introduction

These headlines are unfortunately typical of the news about new mass transit systems. Not stated, but clearly implicit within these headlines, are the potential hazards of injury, loss of life, legal actions and loss of revenue.

Operations research workers should make available their analytical and training support skills to mass transit authorities for planning and training for emergencies. By looking ahead, preparations and training can be directed towards readiness to meet the unknown emergency which could occur tomorrow. This readiness provides the basis for planned actions, not reactions, within the mass transit system itself, and more importantly, in the organizations which must interface with the mass transit system. Fire, police, rescue, hospitals, public utility and local government organizations can then better understand the emergency situation. Casualty control

training offers mass transit management a means of minimizing losses in human life, equipment and revenue.

This is a classic case of technology transfer of military operations research expertise to a similar type problem in the civilian public sector. Military operations research analysts might study the capabilities of an enemy to damage the fleet while civilian OR analysts examine the risks of potential disasters such as floods, computer failures and use of drugs by operating personnel. Military OR teams often use war games both as a method of training operational personnel at institutions such as the Naval War College, Newport, Rhode Island and as a means of studying a new problem by illuminating the issues of operational readiness preparation and damage control.

This paper is divided into three sections: A brief statement of the problem; A discussion of the major elements to be considered in the solution of the problem; A presentation of an example of an approach to solve a typical mass transit system's planning problem in preparation for emergencies.

The Problem of Planning for Emergencies for Mass Transit Systems

The goal of mass transit systems is to provide reliable transportation to passengers. Natural disasters, equipment failure, and human error can occur unexpectedly with grave impact. Are transit systems adequately prepared and properly trained to cope with these emergencies? And just as importantly, are the other agencies which would respond to an emergency aware of the scope of the emergency and are they fully coordinated?

The San Francisco Bay Area Rapid Transit (BART) and the local community agencies were not ready on January 17, 1979. A subway train enroute from Oakland to San Francisco caught fire. Almost everything that could go wrong, did go wrong. The Oakland Fire Department sent equipment to the wrong location. The tunnel's ventilation system, which was supposed to clear smoke from the fire area, was improperly operated, making the smoke worse, not better. The subway cars had been built with seats made of polyurethane, a highly flammable plastic that emits toxic fumes when ignited. Firefighters had to contend with dense black smoke. The communications system was found to be inadequate. The BART dispatcher sent two trains loaded with passengers into the tube while the fire was still raging. Fortunately, a BART supervisor who just happened to be on board the train, was able to take control of all the passengers and

lead them to the front car of the seven car train where they were rescued. It took firefighters seven hours to control the fire. The California Public utilities Commission forced BART to close the tube for eleven weeks resulting in a loss of $5 million in revenue. BART has since replaced the flammable seats in all trains, posted placards in subway cars telling passengers what to do in emergencies just as airlines do in preflight safety briefings, conducted evacuation drills from the tube, drafted written agreements with the San Francisco and Oakland fire departments establishing exact lines of communications and command in emergencies, etc.

Major Elements To Be Considered

Casualties

Washington, D.C. metro officials have, of course, greatly strengthened their planning for fire emergencies after being alerted by the San Francisco fire. However, there are many different types of potential disasters which can result from casualties. A mass transit system must be prepared for emergencies which can occur as a result of: Nature; Machinery; People.

Natural Casualties

Scientists have failed thus far to fully understand various types of natural phenomena although we have been recording data for hundreds of years. We have a long way to go in understanding and therefore predicting such things as earthquakes, volcano eruptions, hurricanes, tornadoes, and floods, and we still even have difficulties in forecasting rain and snow. The problem for mass transit authorities lies in being prepared to cope with the effects of these natural disasters. Table 1 lists representative events in this category.

Table 1 Natural Force Which Could Lead to Disaster

Earthquake; Hurricane; Flood; Rain; Sleet; Hail; Snow; Freezing; Heat Wave; Wind; Thunderstorm; Dust; Lightning; Tornado; Settling.

Machinery Casualties

Reliability and maintenance problems plague all elements of American society from the housewife with a malfunctioning toaster, to her husband with his car and Metro with its transit system. Mass transit authorities must train their personnel to be prepared for major casualties such as power

failures, computer failures and communications system failures. Individual subway trains may have mechanical, hydraulic, electrical, communications, and air conditioning failures. They may be derailed or break down in the most inaccessible spot. Table 2 lists representative types of machinery casualties.

Table 2 Machinery Casualties Which Could Lead to Disaster

Power Failure; Computer Failure; Communications System Failure; Mechanical Breakdown of Subway Cars; Electrical Breakdown of Subway Cars; Communications Failure of Subway Cars; People Casualties; Ventilation System Failures; Derailment; Fire.

People Casualties

Finally, there is the class of casualty caused by people which can lead to disaster. Illness of train drivers or illness of passengers could cause problems. The use of drugs by operating personnel, maintenance people or computer operators could lead to an accident. The possibility of crime being committed on trains and in stations which might lead to disaster is real. Mass transit personnel must guard against suicide, fights, drunkenness, vandalism, sabotage, terrorism, and civil disturbances. And with ever increasing passenger traffic, mass transit authorities must be prepared for riots and panic. Panic is perhaps the most dangerous threat. We can visualize a crowded subway train during the rush hour when a fire might somehow start and ignite something which could emit smoke or fumes. Panic can easily result in the dark with the car full of smoke and fumes and with no one in authority to calm the passengers.

Table 3 People Casualties Which Could Lead to Disaster

Illness, such as heart attack, of subway train drivers; Use of drugs by operating and maintenance personnel; Illness of passengers; Purse snatching; Armed robbery; Rape; Murder; Suicide; Fights; Drunkenness; Vandalism; Arson; Sabotage; Terrorism; Civil disturbances; Riots; Panic.

Insurance and Liability

Preparation for the unexpected and training for quick action/reaction will build confidence in the mass transit system, the riding public, and the company that assures liability coverage. This preparedness, as well as minimizing collateral damage when the unexpected occurs, stands high in

the courts of law when liability is assessed. Companies which have trained and prepared for emergencies tend to be judged as less liable after the fact.

Approach to Solving the Planning Problem of Preparation for Emergencies

An operations research approach would be done in two-phases to enable a mass transit authority to recognize whether or not there is a problem and then to take action for appropriate emergency planning. Phase I would encompass a comprehensive study of the types of emergencies for which the transit authority should be prepared. This risk analysis, study coupled with a review of past damage control planning and training, will indicate emergency situations for which preparation is not yet adequate. This analysis should highlight those events where the risks are sufficiently likely that they should be examined in detail. From these potential disaster events, one representative situation would be chosen in consultation with the transit authority. Phase II would be the design and playing of an emergency planning 'game' which would illuminate the representative disaster situation. The operations research team would design and facilitate the game play. Players, controllers, and observers would provide the overall participation and action play necessary for the transit authority to ensure adequate damage and disaster control preparation and training for the specific situation with actual participation of representatives of all involved agencies such as police, fire, rescue units, hospitals, public utilities, and local government.

The study proposed for Phase I will have the following features: Comprehensiveness – The operations research team will review in a systematic manner the probabilities of occurrence of a wide variety of possible disasters; Independence – The operations research team will be taking a fresh approach to review past planning and to determine if there may be some other types of emergencies which have not yet been considered; Involvement of the mass transit authority – The operations research team will only undertake this project with the cooperation and participation of the pertinent mass transit personnel. Unless the people who must administer a plan participate fully in its preparation, the plan will be neither understood nor accepted.

Phase I will provide the mass transit authority with a risk analysis in the broad sense. Hazard or accident risk will be highlighted for specific

geographical areas if appropriate. Hazard evaluation can indicate specific aspects in which increased safety emphasis would be warranted. Training programs can be tailored to meet the risk. Operating procedures can be altered where deemed essential. Safety and emergency equipment and personnel can be placed in a manner to provide optimum coverage in the event of an untoward occurrence. The scenario deemed the most likely to occur or for which there is the greatest concern and need for the most extensive preparation and pre-coordination would be chosen for Phase II.

The scenario for Phase II will be prepared for use in a game to explore and highlight the actions and interactions of all the agencies which would be involved in responding to mass transit emergencies. This approach was used in a highly effective manner for a National Research Council, Marine Board (1979) examination of actions required in a major marine disaster. The behavior of complex systems and organizations can be explored under realistic conditions. Players carry out 'real world' roles in order for the interactions among the human elements to be examined. The participants in such a game are: Players, who are representatives of agencies or departments that would be involved in the class of decisions being examined; Controllers, who analyze the actions described by the players and develop stimuli for challenging the decision-making capabilities of the-players, analyze player recommendations and decisions, and provide responses to player requests for information; Game directors, who moderate player deliberations, communicate with the controllers, and control the evolution of the problem; Observers, (top management) who do not participate in the game, but rather observe player interactions watching for potential difficulties that would exist in real-world situations.

The mass transit authority and involved local organizations would provide key players from their operational personnel, as desired. Controllers would be chosen from other transit authority personnel and the local organizations involved or from other similar organizations within the United States. The Game Director would normally be that person most qualified in the topic area by virtue of experience. He or she need not know every detail but should be sufficiently broad in experience to draw the most from the players and the play of the game. Observers would be those top management personnel from the transit authority and local organizations involved who can benefit most from the play and from whom summary comments may provide additional insight into the problems addressed.

The tasks listed below under Phase II will be completed by the operations research team using technical knowledge and experience to insure that the game is structured for maximum training benefit. The operations research team will provide the necessary personnel to insure that the game moves freely but positively toward the goals, and will provide data recording personnel for reconstruction and analysis of the exercise for the final report.

The game would be played in spaces provided by the mass transit authority. Size requirements are dictated by the number of people participating. The operations research team will assist in all aspects of game preparation and play.

Emergency Planning Game Details

Gaming is a method of simulation used to explore the behavior of complex organizations and the interactions of the human players. In this planning game, there will be three groups, each in a separate area. The 'game room' where all the essential action takes place will contain all the players plus the game director and his recorders. The 'game control room' contains the umpires-the resource personnel who provide players with information about the course of events. Third, the 'observer room' provides a place for top management to observe the game.

The game controllers provide the players with a scenario of events and information from the outside world that they need to play out their roles. The players describe accurately the actions that they would take in the situation being simulated. The game director keeps the game going.

The principal function of the observers who are usually top management (or deputies) is to observe the play and to be able to discuss the implications of the events or failure of events to occur with their peers. If the game is not exercising the player participants in some critical aspect of an observer's responsibilities, he or she should give recommendations through the chairman of the observers to the Game Director. The overall reasons for the game are both to exercise the actual player participants as well as provide a basis for 'lessons learned' for top management. Top management can come away from the game with a better appreciation of problems and shortcomings. This should help them in planning operational, administrative and budgetary actions to improve the state of readiness of the organization for which they are responsible.

Actual Training Drills

The type of emergency planning game discussed here may be expensive and disruptive for the participants. However, it may be worth while to conduct this type of exercise prior to actual training drills with volunteers for casualties, police, fire, rescue, hospitals, and local government agencies. The actual training sessions done after normal transit hours are more expensive and more disruptive. They are absolutely necessary, of course, to prove that the right people can talk to each other, that coordinated communications can be carried on, and that rescue of simulated injured passengers can take place under the expected adverse conditions, etc.

Summary

As previously discussed, this planning and training for emergencies for mass transit systems would normally be carried out in two Phases.

Phase I - Study and Analysis

Conduct background historical research in mass transit related disasters to determine most likely types of occurrence and the problems usually experienced in the management of disaster recovery.

Conduct comprehensive risk analysis study of disasters caused by natural causes, machinery failures and people. Select types of disasters to be studied further.

Develop system structure information flow for each type of disaster selected for further study. Additionally, the operational sequence of events in the disaster recovery process will be diagrammed and related to the associated system structure information flow.

For the disaster-types selected and the diagrams developed, identify possible time lags in information flow or command communications, determine points in these processes where it is most likely that errors will occur or management mistakes will be made, and describe the possible effects of these errors on disaster recovery.

Conduct background literature research and consult experts to estimate the probability distributions of time delays, errors and mistakes identified above.

Calculate, for the selected type of disaster, the probabilities of alternative outcomes of disasters (which could range from some acceptable outcomes to some very unacceptable outcomes) under current operating

practices. Show how an improved disaster management system could increase probability of more acceptable outcomes.

Provide report of Phase I study.

Phase II - Emergency Planning Game Training

Present results of Phase I to mass transit officials. Recommend and select, in concert, the disaster training situation that is most challenging.

Develop the selected disaster scenario to include all action interfaces with civil, public and private organizations as appropriate.

Produce and deliver the training documents required to support the Emergency Planning Game.

Support and facilitate the Emergency Planning Game during the play.

Prepare and provide a draft of the report of the Phase II game to the mass transit authority and the participating organizations for their review.

Prepare a final report which incorporates the comments and recommendations of each participant.

The final report of the game should contain the overall lessons learned from the exercise, with complete game details given in appendices. Remember that a major value of this whole operation will come from the actual participation of the operational personnel responding to the emergencies of the scenarios and their interactions with the operational personnel of many other organizations. Also if you are in charge of the mass transit authority, be prepared to hear that the 'lessons learned' from the game are what your own safety engineers have been trying to tell you all along!

Potential Savings

Is such an effort as this cost effective? It will be a time consuming, disruptive, expensive, difficult task to plan, schedule, coordinate, and conduct. Is it worth it? The answer may well be yes. Such analysis and training can provide quantifiable savings. If the San Francisco Bay Area Rapid Transit personnel and particularly the civil support organizations had well defined lines of communications and authority, the resultant shut down of that BART system because of the 1979 fire would have been of shorter duration. It is possible that faster and more knowledgeable action in that case could have reduced revenue loss by 20 percent.

Preparation and training in casualty control also may provide reduced liability insurance premiums. While consultation with insurers would provide

specific rate reductions, it is not unreasonable to expect a reduction through accident prevention analysis and training. This overall program of preparing for emergencies should put a mass transit authority in a stronger position both with respect to insurance premium costs and in preparation for potential liability suits. The emphasis on accident prevention and then damage control and rescue of injured passengers will enhance the transit authority's standing in the eyes of the public, the insurance adjuster and the courts.

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Chapter 9
Test and Evaluation Deputy Director – 1982 to 1989

In January 1982, Ellen received a wedding invitation for her to come to Australia in March. Ellen's sister Norah had emigrated to Australia in 1952, a few months after Ellen and I were married on December 27, 1951. Norah had gone to London to inquire about a possible job in Southern Rhodesia in Africa (currently named Zimbabwe.) There was an organization named something like "Organization for Employment of British Women Overseas." Norah had two friends who had emigrated to Southern Rhodesia and wrote Norah glowing tales of how wonderful it was there. Anyhow, when Norah got to the London office and began asking about possible jobs overseas, a lady principal from Australia who was there recruiting teachers persuaded her that she should come to Australia and teach at the Methodist Ladies College near Melbourne.

Norah went to Australia fairly soon after that and had an interesting year at this College. However, it had one big disadvantage. It was not really that close to Melbourne or convenient to get to, and Norah felt that she had too many assignments to stay at the college all weekend to supervise the students who lived in dormitories.

Norah then resigned. She soon saw an ad inviting women to join the Australian Army and become an officer after a year's training course. Norah thrived on the training course and was looking forward to becoming an officer on graduation day. However, just before graduation when they were making arrangements for leave after they became officers, Norah was told that since she was from England, she would only get a transportation allowance of bus fare into the nearest city. All the other women would get transportation allowances back to their homes, so the woman from Perth in Western Australia

would receive air fare for 3,000 miles. Norah told them that they could keep their commission and resigned.

Norah married an Australian and moved up north to Brisbane. She had two sons, Eddie and Peter. Now years later, Eddie was getting married as he was now 18 and had an appointment to become a policeman.

Ellen and I decided that it would be fun to visit Australia and go to the wedding. Lucky for us, Pan American Airways had just bought National Airlines. As a part of the takeover publicity, Pan Am advertised in the newspapers that if you flew anywhere Pan Am went within the first 30 days, you could get a free companion ticket to anywhere Pan Am flew. I had business in Miami, which earned me Ellen's flight to Australia.

I was still job hunting when we received the invitation to Eddie's wedding in Australia. There was one job that was a sure thing if they got the contract they were expecting. If not, that was it. There was a waiting period before a decision would be made, so I decided we should go to the wedding.

The journey to Australia is long, especially from the east coast. We decided that every time the plane landed to refuel, we would get off for a couple of days. So we flew from Washington, D.C. to Los Angeles and stayed with our daughter, Jennifer, for two days. Then we flew to Honolulu and stayed with my sister, Thelma for two days, and then on to Brisbane to be with Ellen's sister and family.

Ellen had not seen her sister Norah for thirty years and had never met her brother-in-law or her two nephews, so it was quite a reunion. The nephews were surprised that Ellen was quite different from her two sisters who looked so much alike that I kept calling Norah "Violet" as I had spent a lot of time with Violet and this was my first time to meet Norah.

Eddie and the bride were both eighteen. The wedding was charming and at the reception almost everyone was serenaded. We were lauded for coming so far for the wedding.

The day after the wedding we went to the airport to see the happy couple off for their honeymoon in Fiji. There were a

lot of station owners (ranchers) at the at the airport who were there to greet the prize bulls they had collectively bought from the United States with the objective of improving their herds. The bulls had all been in quarantine for six months on an island off the coast of Australia. All but one had passed and this was the big day the owners had been waiting for.

A special aircraft had been chartered and a custom ramp built for the bulls to exit the craft. The first one stepped on the ramp—he was enormous. Crunch, the ramp sank several feet. But that was it—all the other bulls were able to disembark without incident.

There was a government representative there who was going to take a sample of sperm from each bull to put in cold storage as a sort of insurance policy.

I have never seen a happier group of people than the station owners greeting their prize bulls. They were expecting great things from them and had invested $150,000 in one prize bull alone.

The next day we went with Norah and her husband Dick to a hardware store to buy a lawn mower for Eddie. He had bought a small house and the grass needed cutting. When Norah told the young sales clerk that Ellen was seeing her sister for the first time in 30 years he said, "That's fair dinkum." He went on to tell us "My cobber's sheila's crook." We didn't have any idea what he was talking about, and even most Australians had to think about it: "My friend's girl friend is sick."

We had good Australian friends whom we had met in Bethesda when their eldest child, Kirsten, was in school with our youngest, Andrew. The father, Dr. Michael Alpers was on assignment to the National Institutes of Health where he was continuing research on "Kuru" (laughing disease) that he started while in Papua New Guinea. He was now back in Papua New Guinea working as the Director of the Papua New Guinea Institute of Medical Research, but his wife, Wendy, was in Perth, Western Australia with the children. We decided that I would visit Michael and Ellen would visit Wendy.

Ellen and I regrouped in Sydney where we visited some Australian friends we met in Rio de Janeiro. Sydney is a beautiful city and they were celebrating the 100th anniversary of the harbor bridge by opening it to foot traffic. We decided to take the walk – our hostess had walked across on the 50th anniversary but declined to join us.

While visiting with these friends I received a call from a head hunter from the Planning Research Corporation interviewing me for a job with CDEC at Fort Ord, California. The young people in the family were impressed that they talked to me for half an hour – international phone rates were much higher in those days.

PRC said they would like to offer me the job, but I said I would like to visit Monterey before making a decision. We were going to stay with our daughter in Los Angeles on the way home, so discussed plans to take a flight up to Monterey. We fell in love with the Monterey Penninsula.

There was still the other job pending so I asked Ellen which one I should take and she said, "Whoever makes a firm offer first." So California won. I have been eternally grateful, as it has been the perfect place for my next phase of life.

Ellen had to fly south to Sidney and then fly west to Perth — a total of almost 3,000 miles to visit Wendy. I only had to fly about 900 miles north to Port Moresby.

Papua New Guinea

Papua New Guinea has almost no roads from the coast up into the mountains. The Australians did this deliberately to keep the tribes in the mountains from fighting with the coastal tribes. The missionaries would get a whole tribe to chop down some trees for a landing strip for a small aircraft such as a Piper Cub to fly in more bibles or kerosene for them. I flew in a small plane to Goroko, a major town in the Eastern Highlands.

Michael Alpers was the Director of the Papua New Guinea Institute of Medical Research. He met my plane and took me to his home. He had two women living there. One volunteer nurse was there for two years from England, and the other

woman was partway through medical school in Adelaide, Australia, who had decided to volunteer for a year.

This was Friday, and after dinner, the two women asked me if I would like to take a walk the next day, Saturday. I was smart enough to ask, "Is this walk going to be on the level or up and down mountains?" "Oh, all on the level. We are practicing to walk down to the coast on a path a couple of months from now." The next morning after breakfast we set out. I finally gave up (about 23 miles down the valley) and the women flagged down a truck and persuaded the driver to take me two miles to the place where Michael was to pick us up. So much for my walkabout in the Eastern Highlands.

A couple days later I flew down to Lae where Amelia Earhart had taken off from on her last leg out over the ocean where she disappeared. I stayed for three days in a motel which consisted of four buildings about 20 feet square with tin roofs and then a dining commons building. It rained like blazes every night, but the white noise put me to sleep.

While in Lae I visited UniTech, the Papua New Guinea Technical University, which had courses in architecture, civil engineering, math, chemistry, etc. The University of Papua New Guinea was at Port Moresby with liberal arts, law, medicine, etc. I was interested in "Intermediate Technology" which was started in England as a movement to apply scientific research to solve practical problems in underdeveloped countries, such as providing safe drinking water, or building houses with local materials such as adobe or bales of hay. In Australia there was a house built of beer bottles filled with sand!

I decided it was time for me to leave Papua New Guinea and meet Ellen to return to the States, when at breakfast on my last day a beautiful – and very black – woman sat down next to me and asked if I thought Columbia University had a good Teacher's College. She was beautiful but her hair stuck out as if she had plugged her fingers into an electric outlet. I told her that Columbia was a great school and she should go there if she could.

On the way home we made a further stop in Auckland, New Zealand and made a note to get back for a longer visit as soon as possible (but that didn't happen).

At the airport, we asked about accommodations and they put us in a sort of boarding house at the seaside a few miles out of town. The owner came to pick us up. This turned out to be a great place to stay, much nicer than a big impersonal hotel in town.

While we were waiting for a bus to take us into town, a Maori woman approached us and started chatting. She told us she had six girls, all grown, and only one had married a Maori. One was a nurse in Australia and married an Australian. Another was married to an American. We found New Zealand delightful. People were very friendly and went out of their way to help us.

Combat Development Experimentation Command

Anyhow, after eleven months of job searching, I did in fact have a good offer which would pay our moving expenses to the Monterey area and give me an interesting job at Fort Ord. I would be the Deputy Executive Director and a couple years later the Chief Scientist at a consumer research sort of job at the Army's Combat Development Experimentation Center at Fort Ord and Fort Hunter Liggett.

We rented a house in Pacific Grove for a year while we looked for a house to buy. We found it interesting that Pacific Grove was founded in 1875 by the Methodist Church in San Francisco which bought eight hundred acres of woods which they divided up into 30-foot by 60-foot lots, just big enough for a tent. This Pacific Grove was to be a religious summer camp. The Methodists put a fence around their Pacific Grove property and promulgated all sorts of Methodist rules of behavior — no drinking, no profanity, no racing buggies down Lighthouse Avenue, the main street through town.

I had to report in at Fort Ord at 0800 on October 1, 1982. My boss, the Executive Director, was Rear Admiral Jack Youngblade, USN (Retired.) The Admiral was a heavy attack pilot who flew the Navy's RA-5C bomber which had been

designed to drop nuclear bombs. Actually, the Navy had decided later that it was not really satisfactory as a carrier-based bomber and had converted them to reconnaissance. Apparently it was a difficult aircraft to land on a carrier, especially in bad weather. The optimum landing speed was about 150 knots. This was critical because if the approach speed was 140 knots the plane might stall and crash. However if the approach speed was above 160 knots, the plane's tailhook might break off and the plane would crash into the ocean. His last job before he retired was being the Director of the National Reconnaissance Office which was in charge of all the American satellites over-flying the Soviet Union.

The US Army had established its Combat Development Experimentation Center at Fort Ord about 1960. The Army gave a contract to the Stanford Research Institute in Palo Alto to provide about 100 civilian engineers, statisticians, physicists, and computer experts at Fort Ord and Fort Hunter Liggett. Their mission was to design tests, collect data, analyze the data to see what the statistics indicated, and prepare a draft of the final report on each test. After three years the Army had to issue a request for proposals on a new contract. A company named BDM of McLean, Virginia submitted a proposal which was much cheaper than the SRI proposal, and therefore as low bidder was awarded the contract. Three years later, several other companies underbid BDM and the contract was awarded to the low bidder, a company named Planning Research Corporation.

There were five different generals assigned to CDEC during before 1983. BG G.L Brookshire was the last general officer from 15 June, 1981 to 23 March, 1983. The Army which had 5000 troops assigned to CDEC in 1973 had gradually reduced the number of troops to a level below which a general would be required to command. Therefore Dr. Marion R. Bryson, a civilian was appointed Director of CDEC on 23 March, 1983.

The Army gave a three year contract on 1 October 1982 to the Planning Research Corporation, McLean Virginia. The $10 million annual contract called for approximately 200 personnel

in the Scientific Support Laboratory. The Laboratory had just completed development of new instrumentation which was being tested.

The war games and field experiments were conducted at the 175,000 acres of Fort Hunter Liggett about 80 miles south of Fort Ord. There was an "Opposition Force" of about 500 personnel including a squadron of tanks stationed there. The new instrumentation included a backpack of a radio beacon for each soldier (both friendly and opposition) which permitted a computer estimate of position location. Tanks of both forces also had a beacon installed. Each soldier and each tank had laser detectors mounted on them. And each soldier and tank had a laser projector mounted on his rifle or tank gun. If Friendly soldier "A" aimed his rifle (with laser projector) at Enemy soldier "B", the CDEC computer system would estimate the range between the two soldiers, pull out of its memory bank the estimated kill probability for that distance and send a message to the "killed" soldier that he was dead (so that he would lie down and play dead).

After the battle was over, the computer system would print a report as to who had fired at whom and the results of this combat.

Admiral Jack Youngblade suddenly had a stroke about three months after we took over the contract and began operating. I become the acting Executive Director. I was not too impressed with the scientific ability of most of our so-called operations analysts. In particular, I was not impressed with a retired Army Colonel who used to be at CDEC when he was on active duty and was now working for us as a civilian.

The Army gave us a project to test how our infantry and tank troops could operate (in Germany for example) if the Soviet attackers used deadly chemical warfare. We had all the troops at Hunter Ligget equipped with MOPP 4 protective clothing. Could they wear these hot and heavy protective coveralls and gas masks for 72-hours? That was the question we were going to scientifically test.

The former Colonel was in charge of operations and planning and had about 20 analysts working for him. We had a planning meeting to work out the details of the test. The Army had issued a requirement to begin the testing by a certain date and finish the testing and write a report by a target deadline. The former Colonel said, "This is impossible. I cannot meet any of these dates." I calmly said, "Very well – I relieve you – you will not participate in this test." He was very upset and went behind my back to complain to the Army Contracting Officer that I didn't know what I was doing. I was called in and explained why I had relieved him and how I was going to meet all the required dates.

I then asked PRC management in Virginia to help me and assign some PRC mathematicians for temporary duty for three months to work for me. Actually the test went off very well and we met all the required dates. Jack recovered from his stroke and resumed his Executive Director responsibilities two weeks after we submitted our draft of the final report on the test.

To my dismay, the PRC management did not fire the Colonel and kept him on because they did not want to disturb some of the Army CDEC people. I decided that I would resign from PRC but stuck around and actually resigned five years after I was hired. PRC had been bought by a hardware company in Connecticut who were trying to expand into computers and government contracting. Then shortly after that, Black and Decker bought the hardware company.

The CDEC Story

In *Planning Researcher*, Planning Research Corporation, McLean, Virginia
Winter 1983, *Ray Latimer*

Advances in technology produce continuous changes to weapon systems and their uses by both friendly and aggressor forces.

Using a 175,000-acre electronic battlefield as its 'test bed,' the U.S. Army's Combat Developments Experimentation Command (CDEC) tests new weapon systems, tactics and training methods. CDEC (pronounced sea-deck), at Fort Ord and Fort Hunter Liggett, California, bridges the gap between new concepts and decision-making.

CDEC's mission is to answer three critical questions for the Department of Defense: How can the U.S. Armed Services best fight? How can they best be equipped? How can they best be organized?

The mission is accomplished in three ways. First, CDEC tests operational concepts, equipment and systems, and organizational structures to verify their usefulness or to develop recommendations for solutions to problems. Second, CDEC develops data from field experiments to be used as inputs for models and simulations. Third, it tests and analyzes the data on development options for both tactics and equipment.

PRC Systems Services joined with Kentron International to build a team of experts to help CDEC meet its mission. This new venture, called Scientific Support Services Company, is the civilian contractor staff in a soldier-scientist team. We help plan the tests, run the experiments, develop computer software, and design and fabricate the instrumentation for experiments CDEC 'hosts' at Fort Hunter Liggett.

The ideas for experiments may come from any of the military services. CDEC's soldier-scientist team takes each approved experiment request and designs a testing sequence for it, which includes defining the test objectives, preparing detailed test design plans and executing the field tests. The team collects and validates the data, analyzes and evaluates it and presents its findings. When asked to do so, it makes recommendations.

CDEC has conducted nearly 50 field experiments in the past few years, ranging from evaluation of navigation aids to testing the effectiveness of aircraft versus armor.

Two current experiments illustrate the way in which the world's most advanced land warfare laboratory works.

V(INT)^2 – Vehicle Integrated Intelligence

During the summer of 1981, the Army Science Board suggested the possibility of an integrated intelligence command and control system that could be vehicle-mounted. The system would provide information from a variety of sources to command and fighting vehicles to improve their combat effectiveness. Such a system would include a computer with artificial intelligence software, very large memory, very high-speed integrated circuitry and an interactive display system.

V(INT)^2 is being tested in a series of experiments over several years, developing from small, simplistic field tests to more elaborate ones, using high-technology instrumentation. The test series constitutes an adaptive program in which later experiments will rely heavily on the results of earlier experiments.

The first objective of V(INT)^2 testing is to determine subjectively whether information on terrain and friendly and enemy locations helps a platoon leader exercise command and control. A second goal is to make a preliminary objective determination of how much combat effectiveness is improved, given the incremental costs of adding more information for the platoon leader (e.g., enemy as well as friendly position locations).

Phase I, in January and February 1982, was to determine if platoon leaders would benefit from a V(INT)^2 display of battlefield information. The tests were conducted in a laboratory, where selected personnel examined visual information displays and closed-circuit television playbacks of trials from an earlier experiment. The test found several elements of battlefield information that might be useful to platoon leaders.

Phase IT-A was conducted in the field in August and September 1982 to provide data and observations to help evaluate the initial assessment.

Phase IT-B, completed in December 1982, tested the usefulness to the leader of an armor or combined-arms platoon of information about the location of his own units and of threat units. The platoon leader received varying levels of information by means of a televised broadcast.

Eighty record field trials and several exploratory trials investigated how much a unit's combat effectiveness is aided by two types of V(INT)^2 information-threat position and friendly position. Trials were conducted with both platoon- and company-size offensive units. Both quantitative data from instrumented vehicles and subjective data from test participants were collected.

A multi-channel television broadcast system was installed at Fort Hunter Liggett for the Phase IT-B tests. The main television transmission originated at the computer complex several kilometers from the tactical playing area.

Because of the hilly terrain and basic line-of-sight transmission in the ultra-high-frequency band, two repeater stations had to be installed to provide adequate coverage.

Television broadcasts to M60 tanks displayed terrain features, roads, map coordinates and other characteristics chosen by the experiment controller. In addition, symbols representing tanks, armored personnel carriers, helicopters and other vehicles could be displayed in their actual positions as they maneuvered on the battlefield. Laser engagements were used to simulate weapon firing between opposing players.

This information was passed through the CDEC range measuring system to a control station, then through a micro-wave link to the main computer complex to determine the probability of casualties and loss of equipment.

The company commander's and platoon leaders' tanks were equipped with television monitors to receive the video display. By comparing performance with baseline trials without broadcasts and other trials in which varying amounts of data were broadcast, the increase or decrease in combat effectiveness from such an intelligence display could be evaluated.

The V(INT)^2 experiments were not intended to help design new equipment but to evaluate whether a vehicle-mounted integrated intelligence command and control system would be useful enough to warrant its cost. By surrogating the system using commercial television equipment and the CDEC instrumented range, possible tactics and equipment for tanks of the future can be analyzed and evaluated.

APACHE-Aviation Performance Assessment in a Chemical Environment

Another current CDEC experiment uses the airspace above Fort Hunter Liggett. The APACHE experiment is evaluating the performance of air crews

in extended combat operations while wearing chemical/biological (CB) protective gear. The results will be used to help assess aviation operations in chemical warfare, to help develop doctrine and to make force development recommendations.

APACHE is being conducted in two phases–training and exploratory trials, followed by attack helicopter team operations.

The test requires three helicopters (two AH-1S and one OH-58) and twelve armored vehicles to serve as enemy targets. During a trial, the three-helicopter team executes three consecutive tactical combat missions without relief. The tests include preflight activities, reconnaissance flights, engagements, refueling, rearming and post-flight activities.

There will be 15 six-hour record trials, seven with the crews in standard combat uniform with no chemical gear, and eight with the crews wearing CB gear and protective masks. The results will be compared.

In addition to the record trials, there will be a two-hour demonstration in which the crews add night vision goggles to the CB gear.

Only the copilot/gunner of the AH-1S and the pilot of the OH-58 will be players. The pilot of the AH-1S and the copilot of the OH-58 will be instructor pilots and will act as controller/safety pilots.

Instrumentation being used in APACHE includes the range measuring system, lasers and laser sensors, closed-circuit television cameras and recorders and ancillary equipment, which permit real-time casualty assessment at the computer complex and provide additional television data for post-trial analysis.

This sophisticated electronic battlefield, with its highly skilled scientific and technical staff, is indeed bridging the gap from concepts to decisions.

The PRC/Kentron joint venture, Scientific Support Services Company, operates the CDEC Scientific Support Laboratory, which includes support departments for plans, experimentation and instrumentation. Our staff is made up of scientists, analysts, computer specialists, engineering technicians and a few administrative people, working at both Fort Ord and Fort Hunter Liggett.

Under the soldier-scientist approach, our staff members support their military counterparts, the project teams that actually field the tests. We are proud to be helping CDEC meet its critical mission for national defense.

Ray Latimer is chief of administration for Scientific Support Services Company. He is a 15-year veteran of PRC and was formerly PRC site manager at Monterey, California.

Sidebar: The test environment

CDEC's field laboratory at Fort Hunter Liggett is the most highly instrumented land warfare laboratory in the world. It is also rich in California history, and in many respects is a most unlikely setting for its current use.

The fort includes 175,000 acres, ranging from level valleys and gentle hills to steep mountains. The highest is the Junipero Serra, at 5,862 feet.

Inhabitants of the fort today include ground and tree squirrels, deer, rabbits, raccoons, wildcats, mountain lions, an occasional bear and plentiful game birds and fish, as well as thousands of cattle grazing on areas leased by ranchers.

The population increases dramatically each summer, when National Guard and Army troops are trained at Fort Hunter Liggett and nearby Camp Roberts, and the sounds of rifle fire, tanks and artillery reverberate through the valleys.

In earlier (and quieter) times, this land was home for California Indians. Some Indian burial grounds have been preserved, and La Cueva Pintata (the Painted Cave) is a major visitor attraction. This 16-foot-high cave in a mountainside, where Indians sought shelter from the elements centuries ago, contains pictographs in various colors that may have had religious significance for the Indians before the Franciscan fathers converted them to Christianity. The cave and paintings have remained in much the same condition for 500 years or more.

The next settlers of the area were Father Junipero Serra and his followers, who founded Mission San Antonio in 1771 near what is now the Hunter Liggett headquarters complex. This was the third mission established by Father Serra and is widely thought to have been the most successful in education and conversion of the Indians.

The mission prospered for about 60 years, then began to decline when the missions were secularized in 1834. For more than a century, disuse and the elements took their toll (with some help from the 1906 San Francisco earthquake). Despite efforts to restore portions of the mission, many of the 21 adobe structures were literally pounded to the ground by heavy rains. Restoration began in earnest in 1948 by the Franciscan Fathers, who now operate the mission and own the 33 acres on which it stands.

On a nearby section of Hunter Liggett, another group of 'settlers'–William Randolph Hearst and his guests, noted for their opulent parties in lush surroundings–wrote a colorful chapter of area history during the 1920s and 30s.

Fort Hunter Liggett is virtually at the back door of Hearst's San Simeon estate on the California coast and was once almost entirely part of Hearst's 240,000-acre landholding in the area. He built a ranch house–called the Hacienda–as the hub of his ranching operation of several thousand cattle and hogs and 10,000 acres of wheat, barley and hay to feed the animals.

The Hacienda, built during 1929-1930, was designed in the California Mission style by Julia Morgan, one of the first women to be nationally recognized as an architect. Many legendary Hearst parties were held there, with Marian Davies, William Powell, Luella Parsons and other celebrities of the day as frequent guests.

In 1940, the U.S. Government bought what is now Fort Hunter Liggett from 17 individuals for $2.2 million. Hearst sold 164,000 acres for $2 million, which left him with 75,000 acres surrounding San Simeon.

The Hacienda is little changed today, with its red-tiled roof, white arches and shaded patios. It now forms part of the CDEC field headquarters.

Leadership and Infantry Effectiveness in Battle

Russell C. Coile and Ernest J. Conway
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Abstract

Research is underway to study factors which contribute to infantry effectiveness in battle. Previous research has indicated that defeat has not been caused by casualties in most battles and that enemy maneuver was often a major factor. This research is using available historical data from the Korean War of 1950-53 to examine the role of leadership. The purpose of this research is to try to obtain some insights which should be of assistance to analysts concerned with studies, models, wargaming and training.

Introduction

Operations research analysts have studied military history to examine the factors that apparently contributed to a forced change of combat posture (sometimes called 'Breakpoint') where, for example, an attacking unit stopped attacking and went on the defensive, or a defending unit stopped defending and attempted to withdraw. One of the purposes of these studies was to examine historical breakpoint conditions in order to improve the realistic conclusion of simulated battles in wargames.

Before we examine historical data on battles, let us review the basics of combat so that we may attempt to identify the key factors which might have affected the outcome of a battle. What are the fundamental organizations or systems in an Army? Let us examine the functions of infantry (and armor) in combat. Things are more complicated than the simple ideas of shoot, move, communicate, survive and sustain. Infantry and tanks fight as 'combined arms' supported by artillery, aviation, engineers, anti-armor and anti-aircraft units, and service units such as supply, maintenance, transport and medical. We also must consider command & control, communications and intelligence. These operational systems are listed in Table 1.

Note that there are different kinds of combat support – artillery, aviation, engineer, anti-armor and anti-aircraft units. Also, there are different kinds of logistical (combat service) support including supply (food, fuel and ammunition) and medical units. The commander and his staff assistants

for personnel, intelligence, operations and logistics have communications systems to provide information and promulgate decisions.

Table 1. Combat Operational Systems

Fighting units (infantry & armor). The infantry has the primary role of closing with and destroying the enemy. Infantry can be mechanized (troops ride in infantry fighting vehicles such as the Bradley), light (troops walk), airborne (troops parachute in), or mountain (troops ski or use snowshoes). Armor units (tanks) operate in combination with infantry units. The missions are: maneuver to attack / prepare defenses; detect and destroy enemy; communicate; survive; sustain.

Artillery support: fire support missions (timely and accurate); interdiction missions; counterfire missions; artillery liaison (plan, detect targets, communicate)

Aviation support: reconnaissance; transport; anti-armor; anti-aircraft.

Engineer support. Mobility: clear minefields; destroy obstacles; build bridges. Countermobility: install minefields; install obstacles; destroy bridges. Survivability: prepare protected positions.

Anti-armor support. Passive: minefields; obstacles. Active: anti-armor weapons (soldier-fired, tank, helicopter).

Anti-aircraft support. Passive: camouflage; dispersal; protection; deception. Active: anti-aircraft weapons (soldier-fired, vehicle, helicopter).

Service support. Supply: food & water; fuel; ammunition. Transport. Maintenance. Medical (treatment & evacuation).

Command & control. Commander's: plan; perception of threat; perception of own forces (location, strength, training, etc). Control systems: command post; maneuver control; intelligence; fire support; logistics.

Communications: facilities (plan, establish, operate, maintain); accuracy and timeliness; survivability.

Intelligence: obtain information on enemy; process/analyze information; disseminate information; electronic warfare.

We need to consider all these systems because land combat is extremely complex. These systems interact and the appropriate support such as artillery firepower must be provided when and where it is requested. Leadership is required to plan the operation, to train the participants, to insure that the logistical support provides the correct ammunition to the right artillery units at the right time, etc.

Now we need to look at what tasks the fighting units actually have in either the attack or defense. Table 2 presents some examples of tasks for both attacker and defender. In task 5, 'Seize key terrain,' the attacker must attempt to carry out his mission while the defender does everything possible to thwart him. If the attacker is actually successful in detecting, destroying the enemy and advancing to occupy the key terrain, he must immediately consolidate his force, plan and prepare his defensive position, and reorganize his survivors for defense.

Table 2. Infantry Combat in Combined Operations

Attacker	**Defender**
1. Recon and clear	1. Prevent reconnaissance
a. advance	a. prepare protection/obstacles
b. detect defender/obstacles	b. avoid detection
c. destroy defenders	c. avoid destruction
d. be able to continue mission	d. destroy attackers at obstacles
2. Breech obstacles	2. Prevent breech
a. advance thru obstacles	a. destroy attackers at obstacles
b. clear lanes in obstacles	b. Prevent lane clearance
c. control breech point	c. neutralize attackers
d. avoid destruction	d. destroy attackers
e. secure the farside	e. counterattack
f. be able to continue mission	f. destroy attackers
3. Conduct assault thru breech	3. Defend against assault
a. advance thru obstacles	a. destroy attackers at obstacles
b. detect defenders	b. avoid detection
c. destroy defenders	c. avoid destruction
d. occupy the breach point	d. destroy/neutralize attackers
e. clear lanes for passage	e. prevent lane clearance
f. control breach point	f. neutralize attackers
g. avoid destruction	g. destroy attackers
h. secure the farside	h. destroy attackers
i. consolidate	i. counterattack
j. reorganize	j. prevent reorganization
k. be able to continue mission	k. destroy attackers

4. Fix the defender to enable maneuver
   a. detect defender
   b. destroy defender
   c. supress defender
   d. hold defenders in place
   e. prevent defenders from moving
   f. be able to continue mission
5. Seize key terrain to facilitate assault
   a. detect enemy
   b. destroy enemy
   c. occupy key terrain
   d. control the objective
   e. consolidate on objective
   f. reorganize on objective
   g. be able to continue

4. Avoid being pinned down
   a. avoid detection
   b. avoid destruction
   c. avoid suppression
   d. avoid being pinned down
   e. move away
   f. destroy attackers
5. Defend key terrain
   a. avoid detection
   b. avoid destruction
   c. repulse attackers
   d. neutralize attackers
   e. counterattack
   f. prevent reorganization
   g. destroy attackers

Each of these tasks can only be accomplished if substantially all of the operational systems work. That is, there must be a plan, troops must be trained and motivated for the particular task, armed with appropriate weapons, have intelligence of reasonable accuracy and timeliness, have proper support from artillery, aviation, engineer, anti- armor and anti-aircraft units, have enough food, water, gasoline, ammunition, medical help, etc., and have leadership with adequate communications if the task is to be accomplished.

One more bit of detail–detection of the enemy–will be presented in order to illustrate the complexity of the process we are studying. While many battles begin with a tremendous pre-assault artillery barrage or area bombing attack, when the attack begins the attackers still must detect the defenders in order to fire at them. This needs to be done during daylight or during a snowstorm or at night, perhaps. Meanwhile, the defenders have organized their position to prevent the attacker from doing all this detecting. Table 3 lists various reconnaissance platforms, starting with the soldier, and various sensors, starting with his eyes.

Table 3. Attacker Detects Defender

Reconnaissance platforms: soldier; recon tank; helicopter; aircraft; satellite.

Sensor: vision; binoculars; night vision devices; camera; TV; radar; seismic intrusion detector; dogs; communications intercept receiver; electronic warfare receiver.

In order to detect an enemy tank so that direct firepower such as an anti-tank guided missile can be fired at it, a soldier can use night vision goggles to detect the tank at night. Of course, a defender can conceivably deny information to these sensors by either interfering with the sensor, damaging the sensor's platform, or by concealing himself. Also, the defender might provide deceptive information by using decoys or communications deception. Figure 4 shows some of these options.

Table 4. Defender Avoids Detection

Deny information to Sensor: Interfere. Destroy recon platform: soldier; tank; helo; aircraft; satellite. Interfere with sensor: use smoke; jam radar. Jam recon communications. Conceal: camouflage; foxhole/bunker; hide; disperse; evade; use terrain, trees, etc.

Provide deceptive information: Decoys (visual/IR tank decoys); communications deception; deceptive recon communications.

Previous Research

The Operations Research Office, Johns Hopkins University, published a study, *Casualties as a Measure of the Loss of Combat Effectiveness of an Infantry Battalion* (Clark, 1954) of 44 American infantry battalions involved in World War II combat against German troops in the European theater of operations during 1944 and 1945. Some of the major conclusions of the study were:

'The statement that a unit can be considered no longer combat effective when it has suffered a specific casualty percentage is a gross over-simplification not supported by combat data.'

'Of the variables other than casualties which may affect the ability of an infantry battalion to carry out its mission, it is believed that failures and breakdowns in leadership, fire support and reinforcement, and communications are the most frequent and powerful influences.'

Richard Adkins analyzed the factors which might contribute to combat ineffectiveness in his thesis, *Analysis of Unit Breakpoints in Land Combat* at the Naval Postgraduate School (Adkins, 1975) Atkins listed fourteen variables which he felt might affect breakpoints in land combat. These variables are shown in Table 5.

Table 5. State Variables

Mission and associated objectives; Number of casualties and number of key personnel who are casualties; Rate at which casualties are occurring; Availability of critical supplies; Availability of communications with subordinate units and higher HQs; Force ratio of friendly and enemy combatants; Relative tactical posture of friendly and enemy combatants; Training and experience level of friendly combatants; Fatigue and motivation; Proportion of reserves committed; Status of adjacent units; Weather and terrain conditions; Availability of reinforcements and supporting fires; Availability of means to evacuate and treat casualties.

Adkins felt that the decision making process leading to a forced posture change would be based on the values or perceived values of a combination of these state variable deemed relevant to the tactical situation

A U.S. Army Concepts Analysis Agency study examined 80 battles of World War II and the 1967 and 1973 Arab-Israeli wars. A summary of the work, *Battle Outcomes: Casualty Rates as a Measure of Defeat* (McQuie, 1987) concluded that in most battles, defeat has not been caused by casualties. A detailed review indicated that the most likely reason that the loser gave up could be identified in 52 of the 80 battles. The reasons in these 52 battles were listed in Table 6.

Table 6. Reasons the Loser Gave Up

Maneuver by Enemy:	
Envelopment, encirclement, penetration	33 %
Adjacent friendly unit withdrew	13 %
Enemy occupied key terrain	6 %
Enemy achieved surprise	8 %

Enemy reinforced	4 %
Total	*64 %*
Firepower by Enemy:	
Casualties or equipment losses	10 %
Heavy artillery and air attacks by enemy	2 %
Total	*12 %*
Other Reasons:	
No reserves left	12 %
Supply shortage	2 %
Truce or surrender	6 %
Change in Weather	2 %
Orders to withdraw	2 %
Total	*24 %*

The importance of enemy maneuver in these battles seemed clear, as was the small role of actual casualties.

Another study sponsored by the U.S. Army Concepts Analysis Agency, *Forced Changes of Combat Posture* (Fain, et al, 1988) had four phases. The team surveyed the literature of forced posture changes, gathered groups of veterans to discuss their combat experiences in some selected battles, gathered historical data for a number of additional battles, and then developed a model for use in a combat simulation to terminate the engagement.

A small number of veterans who had participated in some of the combat operations being studied by Dr. Fain's team were invited to give their opinions as to the factors that they felt had contributed to the failure or success of particular battles. The key factors in breakpoints, as judged by veterans (Figure 111-2 in Fain, 1988) were those listed in Table 7.

Table 7. Opinions as to Key Factors in Breakpoints

Force Strength Factors: High Enemy-friendly force ratio; Low-troop-frontage ratio; High casualty rate.

Tactical Factors: Enemy maneuver/flank/envelop; Force tactically vulnerable; High-level intelligence failure.

Environment Factors: Terrain broken by crevasses; Terrain hilly/heavily forested; Poor road net.

Means and Materiel Factors: Poor communications; No anti-tank weapons; Low ammunition; No air support; No/poor artillery support; No air supply; Poor/no maps; Low/no food.

Human Factors: Poor leadership; Poor staff work; Poor cohesion/esprit; Inexperienced officers for inexperienced troops; Poor training and fitness; Poor training for specific operation; Poor joint engineer/infantry training and coordination; Little/no unit combat experience; High personnel turnover/replacement; Little time in position before operation; Troop expectation of quiet sector; Confusion among troops as to orders and objectives; Exhaustion/time in combat in current operation.

Fain's team considered these opinions of the veterans and a number of other factors and reduced their first list of more than eighty specific factors to thirty nine. The factors considered for their model (Figure V-3, Fain, 1988) were those listed in Table 8.

Table 8. Factors considered for Breakpoint Model

High enemy/friendly force ratio; Perception of high enemy/friendly force ratio; Heavy personnel casualties; Severe equipment losses; Defective tactical plan; Low troops/frontage ratio; Force in tactically vulnerable position; Surprise by enemy; Enemy occupied key terrain; Unfavorable status of unit in adjacent sector; Flanking, envelopment, penetration; Unfavorable advance rate by the attacker; Lack of artillery/air support; Heavy enemy artillery and air attacks; Lack of reserves; Supply shortage; Inadequate weapons; Lack of food, hunger; Low ammunition; Communications failure; Poor reconnaissance; Intelligence failure; Pre-combat fatigue; Little time in line before engagement; Hasty unit commitment on new ground; Poor overall training and experience; Poor training for specific operation; Inadequate combined arms training; Troop exhaustion during combat; Poor morale; High personnel turnover/replacement; Low mission urgency; Poor

leadership; Poor staff work; Troop confusion over orders, objectives; Poor or no maps; Poor road net; Weather change; Unfavorable terrain.

A model of forced posture changes ('breakpoints') suitable for incorporation into an Army ground combat model was then developed. The team considered: a) the opinions presented in Table 7, b) other factors suggested earlier by the analysts conducting research studies, and c) additional factors the team felt were important from its own historical studies of additional battles. The breakpoint model consists of five specific factors from the 39 factors of Table 8. These factors are: Tactical Situation: Total Distance Advanced/Width of Front; Relative Combat Strength: Personnel Ratio (attacker/defender); and Combat Losses: Attacker Casualties, Defender Casualties, and Casualty Ratio (attacker/defender).

The model is based on attacker and defender casualties and their ratio as well as incorporating concepts of the attacker's advance and the relative personnel ratio. This seems surprising in view of the three earlier research studies on casualties which had generally concluded that casualties were not the key cause of defeat, in most battles.

This breakpoint model predicted the correct posture change for about 80 % of the battles when tested against the 83 historical engagements. The team's own analysis of the breakpoint model results which were inconsistent with historical experience identified seven factors not present in the model which may have been responsible for these results. These factors were: Armor imbalance (12 engagements); Relative 'combat effectiveness:' troop quality, training, combat experience, leadership and other such human factors (10 engagements); Air support imbalance (8 engagements); Physical obstacles favoring defense: terrain, fortifications, urban environment (6 engagements); Surprise (5 engagements); Differences in national military characteristics: e.g. Japanese commanders accepted casualties that would have been completely unacceptable to German or American commanders (4 engagements).

Current Research

Our current research is following up on a suggestion made by Clark, author of the Operations Research Office 1954 study, that leadership may have a powerful influence on the outcome of a battle, and a suggestion made by Dr. Fain of the 1988 study group that Korean War data be examined.

General Harold K. Johnson, U.S. Army Chief of Staff 1964-68, has stated that, in his opinion, U.S. Army experience in World Wars I and II had shown that, except in rare cases, every unit breaks on initial contact with the enemy. One military correspondent (Blair, 1987) complained that the failure of most American divisions in combat baptism is seldom discussed by Army historians. Our study is using available historical data to examine some combat events to attempt to find which factors were the critical ones in the defeat of a unit in initial combat. An initial survey of some Korean War engagements has indicated that the following battles should be studied:

5 July 1950 1st Bn/21st Inf Regt Men – panicked and 'bugged-out;' 6 July 1950 1st Bn/34th Inf Regt – Disgraceful bug-out; 6 July 1950 3d Bn/34 Inf Regt – Not yet fired upon, undisciplined flight, abandoned weapons, ammo, helmets, shoes; 10 July 1950 3d Bn/21st Inf Regt – Buckled and fled; 16 July 1950 1st Bn/19th Inf Regt – Disgraceful withdrawal; 22 July 1950 1st Bn/24th Inf Regt – Commanding officer of A Company court-martialed for deserting, sentenced to death; 22 July 1950 2d Bn/35th Inf Regt – Fiasco, panic and a bug out; 23 July 1950 1st Bn/5th Cav Regt – Leadership chaotic or worse; 24 July 1950 2d Bn/8th Cav Regt – Many men and 7 of 11 tanks lost; 25 July 1950 2d BnI7th Cav Regt – Buckled and chaotic withdrawal; 27 July 1950 3d Bn/29th Inf Regt – All weapons and vehicles lost; 27 July 1950 1st Bn/29th Inf Regt – Disaster for two companies; 2 August 1950 1st Bn/29th Inf Div – Bn fell back in confusion; 6 August 1950 3d Bn/34th Inf Regt – Bn fled in all directions; 6 August 1950 1st Bn/34th Inf Regt – Bn shattered and scattered; 7 August 1950 3d Bn/24th Inf Regt – Bn stampeded; 8 August 1950 1st Bn/9th Inf Regt – Bn recoiled and drifted away; 9 August 1950 1st Bn/19th Inf Reg – Bn incapable of action; 12 August 1950 1st Bn/5thRCT – Epic disaster to artillery; 12 August 1950 2d Bn/5th RCT – Epic disaster to artillery; 12 August 1950 3d Bn/24th Inf Regt – Men bugged out in droves; 14 August 1950 19th Inf Regt – Incapable of offensive action (Bn commanders transferred out); 14 August 1950 34th Inf Regt – Incapable of offensive action (Regiment deactivated); 14 August 1950 2d Bn/5th Cav Div – Attack caught Bn napping; 1 Sept 1950 1st Bn/24th Inf Div – Bn broke and fled to the rear; 1 Sept 1950 2d Bn/24th Inf Div – Most of the Bn fled its positions; 2 Sept 1950 9th Inf Regt – Regiment overrun and disorganized (Regimental commander relieved); 4 Sept 1950 1st Cav Regt – Regiment all but disintegrated; 4 Sept 1950 2d Bn/8th Cav –

Company commander balked, relieved; 2 Nov 1950 8th Cav Regt – Regt took to the hills, fleeing (Regimental commander relieved); 4 Nov 1950 1st Bn/19th Inf Regt – C Company cut off, surrendered; 25 Nov 1950 1st Bn/24th Inf Regt – C Company surrendered; 25 Nov 1950 1st Bn/9th Inf Regt – Bn commander relieved; 25 Nov 1950 2d Bn/24th Inf Regt – Bn came apart; 26 Nov 1950 3d Bn/38th Inf Regt – Two companies wiped out; 27 Nov 1950 1st Bn/9th Inf Regt – Bn fell back in disarray; 27 Nov 1950 3d Bn/9th Inf Regt – Bn gave way; 29 Nov 1950 2d Bn/5th Cav – Bn lost most vehicles and weapons; 29 Nov 1950 32d Inf Regt – Regimental commander captured; 30 Nov 1950 2d Inf Div – Lost cohesiveness and integrity (Division commanding general relieved); 30 Nov 1950 2d Bn/31st Inf Regt – Bn faltered and rout began (Battalion commander relieved); 1 Dec 1950 1st Bn/32th Inf Regt – Task force cease to exist; 1 Dec 1950 3d Bn/31st Inf Regt – Bn annihilated; 2 Dec 1950 3d Bn/24th Inf Regt – Bn commander relieved.

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Chapter 10
Emergency Program Manager – 1990 to 2000

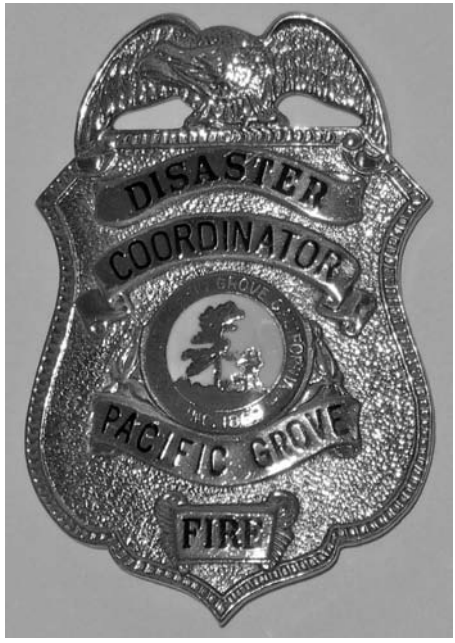
I was again looking for a job in 1989, although I wasn't looking too hard because I was now 72-years-old and thinking about slowing down. Was I in for a surprise. The next ten years turned out to be some of my busiest years.

It started out innocently enough with a small advertisement in our local newspaper that I happened to read. "Wanted: someone half-time for six months to finish writing an updated earthquake plan for the City of Pacific Grove." We had lived in Pacific Grove since 1982 when I began a job at Fort Ord, seven miles away. I immediately filed an application, pointing out that I had worked for several years at a geophysical observatory in charge of a seismograph for recording earthquakes. In fact, I had been in a big magnitude 8.4 Richter scale earthquake in Lima, Peru on May 24, 1940, when more than 200 people were killed. I got the job, perhaps because I lived in Pacific Grove while most of the other half dozen applicants lived in North Carolina or Virginia or somewhere like that.

I was lucky that the Federal Emergency Management Agency started a program at that time to help states and cities develop emergency plans. I was coached by Sacramento to write an application for the city of Pacific Grove to apply for a grant which would pay half of my salary. The City Manager was really interested in earthquake preparedness which was a plus. The City's administrative services/finance director was not, and he persuaded the City Manager to approve his scheme of my only being allowed to work 19 hours a week, thus not receiving any medical, retirement, etc benefits since I was less than half-time. I didn't realize that this was immoral, but there were a half dozen other employees in the same boat.

As it turned out, this 19-hours was good for me, as it gave me time to do all sorts of volunteer things in disaster management.

Gary Bales, the City Manager, assigned me to the Fire Department where the Chief, Charlie Wilkins, gave me an office, a computer and a badge. He was embarrassed that the City was paying a Ph.D like me such a small salary that he asked me if I would wear a badge if he gave me one. I was very happy to do so since I was the only disaster manager to wear a badge in the whole state.



My badge as Disaster Coordianator for the Pacific Grove Fire Department.

Chief Charlie Wilson is a wonderful person and really took care of his people – if you worked for him you were part of the family.

This was demonstrated when I had a heart attack in May 1990, just eight months after starting the job. I was working Ellen's compost bins—turning them to encourage decomposition—when I had pains in my chest. I ignored them, thought I had just overdone it. I went back to finish the job the next day and the pains came back, so I told Ellen. She said "we have to go to see Dr. D'Ambrosio immediately,"

which we did. Dr. D (as he is affectionately known by his patients) went to action stations. Although I was seeing him at an Army clinic, he is a cardiologist and obviously one of the best. He suggested I go to Stanford University Hospital. He explained that I could go to Letterman Army Hospital and it wouldn't cost me a penny, but said, "If it were my father I would send him to Stanford."

So Dr. D made the appointment and Ellen and I went to keep it. I had an electrocardiogram which showed quadruple blockages. Dr. D pointed at one of the blockages in a diagram of arteries going into and out of the heart and said, "This one we call the 'Widow-maker!'" The Stanford doctor counseled me and said I could have a steadily diminished lifestyle for about two years. Or, I could have bypass surgery. I opted for the surgery. Nineteen years later, I think I made the right decision. I've done lots of things in those nineteen years, and counting, plus got to see the entire life of my granddaughter Sienna.

While I was in the hospital, before surgery, a doctoral candidate asked if I would be a subject in his research. As a research scientist, I knew how important it was to get research subjects, so I readily agreed. He was so used to being turned down he kept trying to convince me. Finally, Ellen interjected, pointing out that I had said yes. It involved having some electrical cables attached to my heart so he could measure my response to stress, anger, etc. They would be easily removed when the experiment was over.

He told me to think of something that made me angry and was disappointed when there was barely a response. I was finally able to think of something that gave a slight response so I wasn't much help to him.

When it was time for me to home from Stanford, five days after the surgery, Chief Wilson and his Assistant Chief insisted on going to Stanford to bring me home. They wanted to have me in the Chief's car which had emergency radio, oxygen, etc.

The surprising thing to me was the slow healing of my leg where they took the artery to use to patch the ones near the

heart. I thought healing the chest that they had cracked open would be worst.

I did have an interesting and challenging job. I was responsible for disaster preparedness for the City of Pacific Grove. My duties included: initiating emergency preparedness programs, revising and updating the City's Multi-Hazard Emergency Plan, designing the City's Emergency Operating Center, writing Emergency Operating Center Standard Operating Procedures, planning and conducting the City's exercises such as the participation in the annual statewide earthquake exercise each April, conducting public education programs, writing the City's Radio Amateur Civil Emergency Service Plan, organizing local amateur radio operators in the City's RACES group, teaching and organizing the City's Volunteers in Preparedness (neighborhood emergency response teams), and training all City employees in the State's Standardized Emergency Management System (SEMS).

Jennifer's Wedding 1991

I noticed the America's Cup Team all wore Tilley hats. I was impressed with the quality of construction, lifetime guarantee, and the "Owner's Manual." When Jennifer told us she was getting married I decided to offer to buy Tilley hats for all of my relations. Jennifer suggested that everyone should bring them to her wedding in Los Angeles so that the wedding photographer could do a professional portrait of everyone (except the bride) wearing the hats. I sent the photo to the Tilley corporate headquarters in Toronto. They used the photo and an excerpt from my letter in newspaper advertisements across Canada. The photo is still hanging in the entrance to their flagship store in Toronto, along with other letters from happy Tilley wearers in outdoor adventures all over the globe.

Jennifer's wedding party all wearing their Tilley Hats. Front Row: Grand-nephew David Craig, Niece-in-law Sue Craig, wife Ellen, daughter-in-law Lori Coile, daughter-in-law Wendy Coile (Jonathan's Wife), granddaughter Courtney Coile. Back Row: Son Andrew, nephew Nessly Craig, me, Daughter Jennifer the Bride, son-in-law John Robrock the groom, son Jonathan, and grandson Zachary Coile.

Catamaran Trip 1994

Buoyed by the happy experience of the fishing trip the previous year, we decided to charter a French catamaran, 42-feet long, to cruise the Chesapeake Bay for a week. Jennifer was included for an "all my kids" cruise. It was a very spacious boat.

Jonathan boarded the boat in Annapolis and brought it back to his backyard dock to load the provisions. Andrew and Jennifer helped stock the food and drink so that we could alternate meals on board with dinners ashore. We got underway and headed down the Severn River, stopping at Chris' private island – St. Helena Island – to pick him up. Chris came aboard with bandages on his nose, straight from outpatient surgery for a deviated septum. Russell Jr. had work

conflicts so had to meet us in Norfolk and then sail back north to Annapolis.

The first day was unusually rough weather. There was some stretches with poor visibility so we were glad to have Andrew along to sort out the high tech depth finder, GPS with brand new moving map and other navigational gear. At night we watched comedy movies on the VCR where the younger generation introduced me to movies like "Wayne's World" and "My Cousin Vinny."

The kids and I took turns navigating. At one point there were five laptops out as people were catching up on work. Andrew rigged up an Internet connection for those who needed email. We laughed about how everyone was self-employed so they weren't necessarily getting paid time off work.

We stopped in Reedville one night and pulled up in Norfolk's downtown harbor, in the renovated area alongside the Nautilus Museum. We used a lot of the "iron topsail" to get down to Norfolk in time to meet Russell Jr. but for the last three hour sail down the bay and into the shelter behind Fort Monroe the wind got up to the high twenties and we had the Catamaran screaming along on a broad reach at twelve to fourteen knots. Surfing down one big wave, the knot meter touched 16 briefly, a speed record for the boat.

In retrospect we spent more time on the boat motoring than doing relaxing side trips on land. Probably our favorite day was on Tangier Island, where the people still speak English with a distinctive Elizabethan-era accent. They don't sound like they are straight out of a Shakespeare play as the original inhabitants were humble fishermen from Cornwall, so what has been passed down through the centuries is a working-man's Elizabethan dialect. We rented bikes and enjoyed a traditional crab dinner at Hilda Crockett's. Since it was off season, we had the place to ourselves.

Christopher, Jonathan, Andrew, Russell, Jennifer and Russell, Jr. on Tangier Island.

One morning, at Windmill Point Marina near where the Rappahannock River, Potomac and Chesapeake come together, Chris and Russ suggested we play golf after breakfast. I had taken a class in golfing at Monterey Peninsula College not long after we bought the house in Pacific Grove on the Pacific Grove Municipal Golf Course and bought some used clubs. In my class we always seemed to be in the classroom and not out on the green with our clubs, so I didn't gain much proficiency. The course was overgrown but we had a lot of fun.

Windmill Point Marina had a fairly fancy restaurant, compared to small town/boondocks coffee shops we had eaten in on previous days. We started to look over the menu and were impressed by the list of Appetizers. As we started to discuss which ones to get, Chris said "Get all of them." This seemed like a bold idea, but then we thought about eight appetizers divided by six of us, so it really would be just a

few bites each. Years later, I was in a situation with Chris involving choices and I joked "Hey, why not get all of them, just like you told us to do with the appetizers?" He laughed and said, "But Dad, appetizers is one thing, this is another!"

When we returned the boat to its home dock in downtown Annapolis, the Blue Angels were flying over at low altitude. The airplane noise was a shock after the quiet of places like Tangier Island.

Exploring the island community in the middle of the Chesapeake. Here I am making a courtesy call on the Fire Department. Nobody home.

Here is an example of what I did in a single year as the Emergency Program Manager for Pacific Grove, California:

Earthquake Exercise

Nineteen Ninety-Seven was an interesting year for me as a lot of things happened. For example, the City of Pacific Grove participated in the State of California's annual earthquake exercise for the seventh year in a row. I felt that it was sad

that none of the other 11 cities in Monterey County had ever participated in the States's annual exercise on the first Tuesday in April, and our County had never participated. Twice in ten years the Monterey County Grand Jury investigated earthquake preparedness in the county. Each report gave a pat on the back to Pacific Grove for its readiness and a stern letter to the other cities asking why they were so unprepared. Our City Manager supported me every year when I recommended that we participate.

The Mayor issued a proclamation declaring April 1997 as Earthquake Preparedness Month in Pacific Grove. The State's earthquake exercise was at 10:30 am on Tuesday April 1. An alternate emergency operations center (EOC) was activated by the City Manager/Director of Emergency Services since the scenario (which I had prepared) had the Community Center heavily damaged by the earthquake. Harry Robins, Monterey County Operational Area Emergency Manager and Barbara McPhail, Governor's Office of Emergency Services, Coastal Region participated as observer/evaluators. Members of the City's Disaster Council, including PG&E and Chamber of Commerce representatives participated. Amateur radio operators in the EOC communicated with amateurs at the City of Monterey's EOC, Carmel Red Cross, Community Hospital, Salvation Army and Stanford University's Hopkins Marine Station. Pacific Grove Boy Scouts served as pages to deliver messages inside the EOC and assisted with EOC registration and security.

After exercise play ended, Mark Carbonero, Radio Station KOCN, gave a briefing on the introduction of the new FCC/FEMA "Emergency Alerting System (EAS)" which has replaced the old Civil Defense "Emergency Broadcasting System (EBS)." Roger Ince, Monterey County Red Cross, gave a talk on Red Cross plans for providing mass care and shelter for earthquake victims in Pacific Grove.

Stanford University's Hopkins Marine Station had an earthquake damage evacuation exercise and pretended that one of their marine biologists was missing. The Monterey Bay Search Dogs went into action and found the missing

biologist (my son-in-law, John Robrock, a last minute replacement for the Boy Scout who had volunteered to be buried alive but whose Mother had told him to un-volunteer) buried under (pretend) earthquake rubble. Two TV stations filmed this search event and put it on the evening news. The Californian newspaper in Salinas also printed a picture of the search action. Dogs always get their photograph in the newspaper.

US-Chinese Researcher Exchange Visits

I submitted a proposal on December 4, 1996 to the National Science Foundation's National Center for Earthquake Engineering Research (NCEER) at the State University of New York – Buffalo suggesting that Chinese earthquake preparedness researchers be invited to Pacific Grove to observe the City's participation in California's annual statewide earthquake exercise scheduled for April 1, 1997. The Chinese would also learn about: our Fire Department's educational programs, such as the Volunteers in Preparedness (VIP) neighborhood emergency response teams and training in the State of California's new Standardized Emergency Management System (SEMS). An exchange visit to learn about Chinese earthquake preparedness would be made by me to China.

By coincidence, the January, 1997 issue of the *Journal of the American Society of Information Science* had a paper by a Chinese at the School of Information Management and Systems, University of California, Berkeley who presented an analysis of citations and translations in Chinese library and information science literature. For example, citation data were collected from seven major Chinese journals of library and information science from 1983 to 1990. Appendix A: Most Heavily Cited and Translated Authors, and Appendix B: The 33 Most Heavily Cited English-Language Publications listed names of two Nobel prize-winners, various professors at Harvard, Yale, Cornell, Stanford, Cambridge, University of California-Berkeley, Chicago and Coile, R.C. It was indeed a surprise to see a paper written by me in 1977 (in starving student days working on his Ph.D) listed as heavily cited

in China. Therefore, a letter was rushed off to Buffalo to the National Earthquake Engineering Research Center pointing out that some Chinese had found his earlier research useful and that it was hoped that some seismologists in Beijing would be given a grant to come to Pacific Grove to find out what useful things I was now involved with.

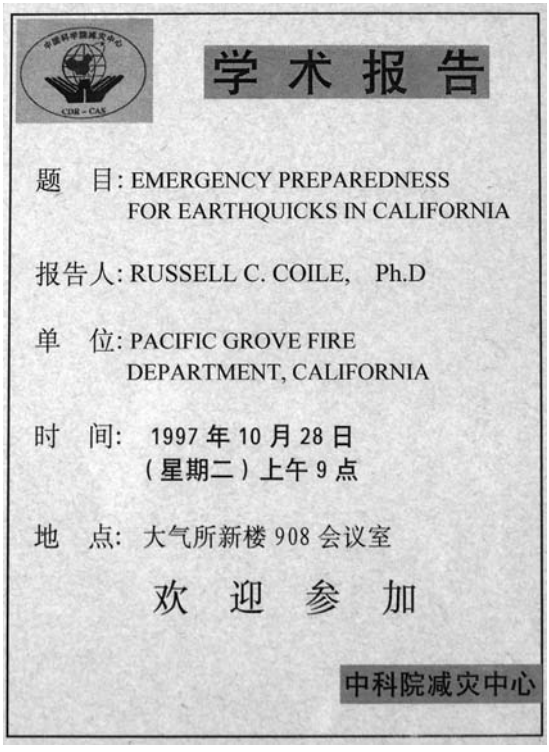
My proposal that Chinese earthquake preparedness researchers be invited to Pacific Grove to observe the City's participation in California's annual statewide earthquake exercise scheduled for April 1, 1997 survived initial reviews by to the National Center for Earthquake Engineering Research and the National Science Foundation. The NCCER notified me on February 12 that:

"Key information from all proposals submitted by the close of business on December 4, 1996 were forwarded to NSF officials for review and discussion with their Chinese counterparts at the US-PRC Protocol coordination meeting in early December. As a result of these discussions, NSF has requested that we submit all eligible proposals to an additional external peer review body, which will assess the technical objectives of each proposal, its compatibility with the objectives of the protocol agreement, and the feasibility of the proposed effort. They will then make recommendations to NCCER on selected candidates. Your proposal is one of those presently under consideration. We hope to receive the recommendations of the peer review panel by the first week in March and we will then contact you regarding your status."

Actually, my proposal was still being reviewed in May and the latest word was that a decision might be made by June 6, 1997. Again by coincidence, Pacific Grove's earthquake preparedness received national recognition by the Federal Emergency Management Agency (FEMA). I rushed another letter off to Buffalo pointing out additional reasons why the Chinese should be invited to Pacific Grove since our program "Pacific Grove—A Model for Small City Disaster Preparedness" was included in FEMA's *Compendium of*

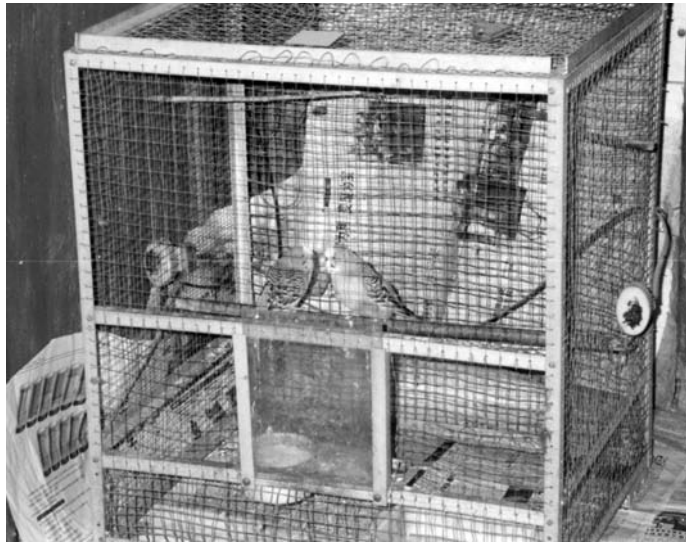
Exemplary Practices in Emergency Management, Volume II after a national search for outstanding projects.

I consequently received a letter from the National Center for Earthquake Engineering Research advising that the City of Pacific Grove's proposal for earthquake researcher exchange visits between Beijing and Pacific Grove had been approved. The NCEER's approved project for earthquake researcher exchange visits between Beijing and Pacific Grove had two phases. First, an invitation was sent from the City Manager to the Chinese Academy of Sciences for Chinese researchers interested in Pacific Grove's earthquake preparedness to visit here on April 8, 1998 to observe the City's participation in the statewide earthquake exercise. Second, an invitation was received from the Chinese Academy of Sciences for me as the city's Emergency Program Manager to visit China from October 10th-31st.



Poster promoting my talk at the Chinese Academy of Sciences.

The Chinese Academy of Sciences hosted me for a lecture on Emergency Preparedness for Earthquakes in California.



Chinese research into measuring the frequency of bird hops on a perch as a predictor of earthquakes.

Chinese Hopping Parakeets

We enjoyed a visit to a special laboratory for earthquake prediction at Beijing Polytechnic. The Chinese are studying different techniques for getting information to help in earthquake prediction, such as: analyzing electrical currents in the earth's crust; animal behavior – for example, they noticed that just before an earthquake the nocturnal yellow weasels would come out in the daytime; and budgerigars would get excited and hop up and down. An instrument in the cage measured how many times per hour the budgerigars jumped up and down on their perch and plotted their hops on a computer. The scientists stated they could detect earthquakes two hundred miles away based on the bird's hops. This experimental research was supported by the Geophysical Section of the Academy of Sciences because of a big earthquake in China where 240,000 were killed at Tangshan in 1976.

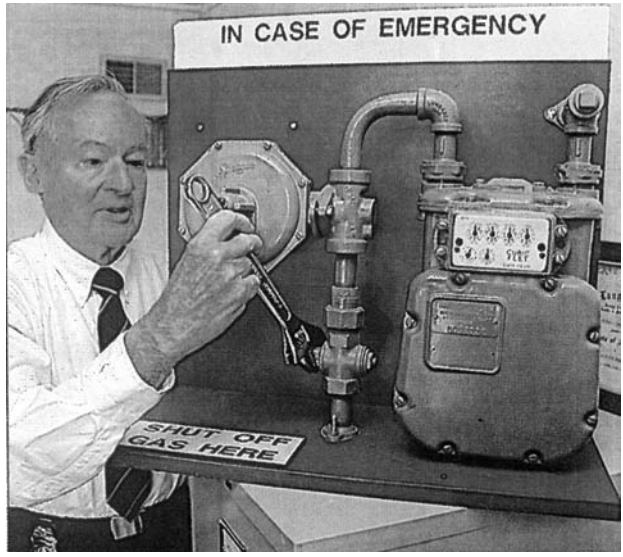
I visited the Center for Disaster Reduction of the Chinese Academy of Sciences, Peking University, Beijing Polytechnic University, the Government's Institute of Atmospheric Physics and Institute of Geology, and met geophysicists from the State Seismological Bureau. I gave a seminar on Pacific Grove's earthquake preparedness program assisted by Ellen who gave a talk on Pacific Grove's Volunteers in Preparedness (neighborhood emergency response teams). I gave the Chinese copies of our earthquake preparedness literature, FEMA and California literature, catalogs of courses at FEMA's Emergency Management Institute and the California Specialized Training Institute, San Luis Obispo, U.S. Geological Survey earthquake literature, disaster journals, Yogi Bear's facts about earthquakes, etc. In return, the Chinese gave me copies of technical journals and government reports. The Chinese researchers appreciated getting our literature as they are just starting public education efforts. The Peoples Liberation Army responds after disasters as they do not have a FEMA type agency.

Ellen and I gave a brief presentation on our visit to China to the Pacific Grove City Council at their December 17, 1997

meeting. I showed council members my 400-page trip report and Ellen presented a Chinese butterfly kite to the Mayor.

United Nations Workshop on Forecasting Of Disasters

I was invited to participate in the planning of a United Nation international workshop on the forecasting of natural disasters by geomagnetic methods. I had been at the Huancayo Magnetic Observatory in Peru for two years while a magnetician on the research staff, Carnegie Institution of Washington some years ago. This UN geomagnetic workshop will be held in Beijing, China from Feb 11-18, 1998, hosted by the Institute of Geology, Chinese Academy of Sciences and the State Seismological Bureau. Dr. J. M. Col, United Nations Department for Economic and Social Affairs and Agnes Asekenye-Oonyu, United Nations Department for Humanitarian Affairs visited me in Pacific Grove on December 30, 1997.



Teaching earthquake preparedness classes about the proper proceedures to shut off gas lines in the event of a break.

Volunteers in Preparedness (VIP)

I taught Neighborhood emergency response team classes on Thursday evenings for Volunteers in Preparedness training

on January 9, 16 and 23, 1997. The program was actually scheduled at the request of graduates of the Pacific Grove Police Department's Citizens Police Academy who were accustomed to doing something meaningful on Thursday nights. Two City Council members, Christie Martine and Morrie Fisher, also attended the VIP program. This means that the Mayor and all City Council Members have taken VIP training.

Federal Emergency Management Agency (FEMA)

Pacific Grove's disaster preparedness program received national recognition when FEMA selected it as one of 38 "exemplary practices" published in a May 1997 report. The Acting Regional Director, FEMA Region IX, sent us FEMA's Certificate of Merit signed by James Lee Witt, Director awarded to the Pacific Grove Fire Department for "Pacific Grove - A Model for Small City Disaster Preparedness." The Mayor gave me a certificate of appreciation at the City Council meeting on August 6, 1997.

FEMA's Emergency Management Assistance Program

The City of Pacific Grove has received a FEMA Emergency Management Assistance Program grant administered by the State of California's Office of Emergency Services (OES) for the past seven years which was specifically designated for half of my salary and benefits. Effective October 1,1997, State OES changed the distribution of all FEMA grants to give the funds only to the County Operational Areas. The City of Pacific Grove was not given any FEMA funding by the Operational Area's Advisory Committee.

American Red Cross

I was invited to participate in a variety of Red Cross activities. Some of these were as follows:

March 28 - Roger Ince, Disaster Manager, Monterey County Chapter American Red Cross and Ms. Stephanie Hall came to Pacific Grove on March 28 to discuss planning for Red

Cross activities in Pacific Grove during the April 1 earthquake exercise with me.

April 8 - I was invited to a Red Cross ceremony in Emeryville on April 8 where the Northern California Disaster Preparedness Network presented him with a certificate for four years of participation on the Tri-County Community Disaster Preparedness Committee.

United States Coast Guard

I attended the regular meeting of the U.S. Coast Guard's Oil Spill Response Working Group at the Moss Landing Harbor Master's Conference Room on January 16, 1997.

Monterey County Operational Area

I met with Harry Robins, County Emergency Manager on February 28, 1997 to request that the Operational Area partially activate its EOC with amateur radio operators from 1000 to 1200 on April 1 in order to participate with the Cities of Pacific Grove and Monterey in the statewide earthquake exercise. As it turned out, the Operational Area did not participate as requested.

Update Of Pacific Grove's Municipal Code

I completed a draft in July, 1997 of an updated, corrected, and revised Chapter 3.20 Civil Defense and Disaster. This revision into Chapter 3.20 Emergency Services was necessary because of the activation of the Standardized Emergency Management System. The City Council approved the revised Chapter 3.20 on August 6, 1997 by passing and adopting Ordinance No. 97-37. Incidentally, the title of "Disaster Coordinator" was changed to "Emergency Program Manager," however *DisasterMan* is just catchier than *EmergencyProgramMan* so I left my web address as www.DisasterMan.com.

SEMS Training

Training Courses on the new Standardized Emergency Training System (SEMS) were given by me during January to

members of the Public Works and Mechanical Departments on January 7, and to the Police Department on January 22.

FEMA Courses

I attended two courses at the Alameda County Sheriff's Department, Dublin, California from March 17 to March 20. These FEMA Emergency Management Institute courses taught by California Specialized Training Institute (CSTI) instructors were: "Advance Exercise Design (G630)" and "Exercise Evaluation (G130)." A full-scale exercise was planned, conducted and evaluated. The scenario involved a terrorist hijacking a bus, six hostages killed when the Sheriff's SWAT team stormed the bus, and a multi-casuality incident for Fire and EMS to rescue, triage, treat, and transport 15 injured hostage victims to hospitals.

Sacramento Fire Department

I attended the Sacramento Fire Department's four-day training conference on September 1-4, 1997 to attend Hazmat classes.

El Nino Weather Briefing

Along with the Public Works Director, I attended the annual County OES weather briefing by the National Weather Service and the California Office of Emergency Services in Salinas on October3, 1997.

Carmel River Flood Committee

I was invited by the County Sheriff's Dept to a meeting on February 20, 1997 in Carmel of the Carmel River Flood Preparedness Committee to hear a presentation by the Water Resources Agency on flood prevention activities.

Carmel River Flood Task Force

I was invited to attend a weather preparedness briefing on El Nino at Rancho Canada at 7 p.m. for Carmel River Valley residents arranged by Mr. Larry Levine, Mission Fields and Monterey County officials.

Neighborhood Emergency Response Teams (NERT)

I attended the San Francisco Fire Department's "train-the-trainers" course for NERT instructors at Monterey on July 28-30, 1997. (Pacific Grove's NERT program is called Volunteers in Preparedness). This was actually a refresher course for me as I had attended the first of the San Francisco Fire Department's trainer courses in January, 1994 at Concord but the course has been improved during the past three years.

Disaster Preparedness Talks

A number of different organizations in Pacific Grove or in the local area requested talks on disaster preparedness by me, as listed below:

"Flood and earthquake preparedness" - Hacienda Carmel, March 26, 1997

"Earthquake preparedness" - Men's Club of the Carmel Foundation, March 31,1997

"Earthquake preparedness" - El Rancho Mobile Homes Park, Marina, April 22, 1997

"Earthquake preparedness" - Charles Apartments, Marina on April 21, 1997. Preparedness literature in Vietnamese, Korean, Spanish, and English was given to residents.

"Disaster preparedness" - Pacific Grove Police Department's Citizens' Police Academy on May 8, 1997. Thirteen of the students indicated an interest in attending in the future the Fire Department's Volunteers in Preparedness neighborhood emergency response team training.

"Communications" at an Internet Conference. On September 29, I was one of four invited speakers on an Internet Live Online Conference of the Emergency Information Infrastructure Program (EIIP) sponsored by FEMA and the National Coordinating Council on Emergency Management. I discussed California's Operational Area Satellite Information System (OASIS) and answered questions from the nationwide audience. The other panelists were: Dr. Lin, National Research Council; Dr. Ward, U.S. Geological Survey; and Lois McCoy, National Urban Search & Rescue.

"Emergency Preparedness for Earthquakes in California" - Center for Disaster Reduction, Chinese Academy of Sciences, Beijing, China on October 28, 1997.

"Disaster preparedness" - Second Pacific Grove Police Department's Citizens' Police Academy on November 20, 1997.

"Earthquake and Winter Storm Preparedness" - Carmel Foundation on December 8, 1997.

"Emergency Program Manager's Visit to China to Discuss Pacific Grove's Earthquake Preparedness" - Pacific Grove City Council meeting on December 17, 1997.

Monterey County Grand Jury

I prepared answers to questions posed to the City as to the status of our earthquake preparedness. A copy of the City's new SEMS Multi-hazard Functional Plan was given to the Grand Jury.

American Society Of Professional Emergency Planners.

I had a paper "Comprehensive Earthquake Preparedness" published in the 1997 Journal of the American Society of Emergency Planners, November 1997.

Salvaging Water-Damaged Materials

FEMA, the National Endowment for the Humanities, the Getty Conservation Institute, and the National Institute for the Conservation of Cultural Property have worked for several years to develop suggestions for protection and salvage of water-damaged materials. A "Salvage Wheel" of helpful instructions was unveiled at a June 11, 1997 press conference in Washington. The Pacific Grove Museum of Natural History was one of 45,000 museums, libraries, archives and historical organizations which received a copy. Any Pacific Grove department in need of advice on water-damaged salvage should contact the Museum. Incidentally, James Lee Witt, FEMA Director has asked the task force to design another wheel which can be used by homeowners for advice on how to salvage flood-damaged personal materials.

National Coordinating Council On Emergency Management

I was invited to serve on the Certification Commission of the National Coordinating Council on Emergency Management for a three year term. The idea of a certification system for emergency managers was originally sponsored by FEMA about eight years ago. I was in the first group of managers to be certified in 1993.

Chinese Academy Of Sciences

I presented a paper at a seminar at the Chinese Academy of Sciences in Beijing, China on October 28, 1997.

That is what it was like to be an Emergency Program Manager, a DisasterMan if you will, for a single year.

April 1996 Aviation World Speed Record

When the Wright brothers made their first flight in 1903, within the first five years, the Wright Brothers, Germans and Italians proposed an international aeronautical association to record which airplane had gone the highest, stayed aloft the longest, etc. One of the Wrights was Member Number 1 of the *Fédération Aéronautique Internationale* (FAI), in Paris.

Jonathan discovered that an annual conference in Paris is held to announce that year's documentation of aviation records e.g. new destinations in space, or an elderly couple in a Cessna 172 who visited all seven continents. He learned that you could set a point-to-point speed record if you get an official observer to document your start and finish times. He arranged for FAA permission for observers in the control towers in airports in Washington, DC and Utica, NY to check the times when Jonathan flew over, for the Official Aviation World Speed Record for the fastest recorded flight from Washington, DC to Rome [NY]. I was listed as co-pilot so that I would be named in the record books as co-holder of the record. Jennifer, Wendy, Andrew and Russell, Jr. served as crew. Hugh and Molly Root and Wendy's sister Gloria and husband Richard met us at the airport in Rome, NY and we flew back after a nice lunch. We didn't go to Paris, but we

enjoyed the US Award Ceremony at the National Air and Space Museum in Washington, sharing the limelight with Shuttle Astronauts and other world record holders.

Jonathan and I receive our US National and World speed record certificates from the chairman of the National Aeronautic Association at the Air & Space Museum in Washington, D.C.

Friendship

One of the aspects of friendship is that most of us live lives which are too busy for us to have as much frequent contact with our friends as we would like to have. That is when a birthday becomes an important event in our lives. A birthday is an event. I am too old to want to receive birthday presents. I am at the stage where I want to give things away, but let me tell you about one birthday, some years ago. The birthday was my 80th.

My daughter, Jennifer, was a new Foreign Service Officer taking an Italian class and other orientation at the U.S. State Department in Washington, D.C. in preparation for posting to the U.S. Consulate in Milan, Italy. Digression: She had

applied to take the State Department's exam to become Foreign Service Officer eight or nine years earlier when she graduated from the University of Maryland. She had taken the written exam and though that she had done well but she never received a letter inviting her to appear for the oral exam which was the second requirement. She had therefore gone to graduate school at Harvard and received Master's degrees in city planning. Then she had worked for five or six years in city planning in Texas, Maryland and California. Another woman who had taken the same written exam as Jennifer and had never been invited for her oral exam went to law school. She then used the Freedom of Information Act to get access to the exam results and the State Department's administrative records on how they had dipped down in lower scores, found a man who had just barely passed and appointed him as a Foreign Service Officer. This woman lawyer was outraged and filed a class action suit against the State Department claiming discrimination. The State Department's lawyer said this was a frivolous suit and denied everything. She appealed seven times and went all the way to the Supreme Court, and the judicial system ultimately agreed with her and ordered the State Department to give the next 39 vacancies to women. Jennifer took a plane to Washington as soon as she was invited in for the oral exam, earned a high score and was one of the 39 women appointed to be Foreign Service Officers at the U.S. Information Agency.

While our daughter Jennifer was at the State Department to get her orientation before leaving for three years in Milan, Italy, she joined an organization called DACOR, Diplomatic and Consular Officers Retired. The DACOR organization has an 1820s mansion near 18th and G Street NW, between the State Department and the White House. In 1980, Mrs. Virginia Bacon bequeathed the house to DACOR after she had lived in it since 1920. The mansion is a beautiful club for retired and active Foreign Service Officers who might be brought back to Washington from their posting in Cambodia, etc. for a month long training session, some treaty negotiations,

vacation or something. It was like an old fashioned club with ten bedrooms, large dining room, living room, library, etc. The servants were all just like the movies, the cooks, butlers, footmen, gardeners, all in uniforms with the butlers with white gloves, etc.

There were about sixty friends present for my birthday dinner. It was an elegant meal served in elegant fashion – "just like dinners at Windsor Castle," Ellen, my English wife, said to me. I have the menu carefully preserved. After dessert, we had a series of spontaneous speeches from the more vocal friends. Evelyn Murray, one of our good friends who lived in the Georgetown section of Washington, D.C., two blocks from Dumbarton Oaks, the Harvard University residential research center for scholars who specialize in the Byzantine Empire (649 to 1200 AD or so), spoke first. Evelyn said that she was the first to speak because age was greatly respected in China and she was the oldest person at the birthday party. "I am 93 and I still drive my car in Washington using a stick shift – no automatic transmission for me," she said. Evelyn announced that she had two pieces of advice for longevity. 1. Eat a banana every day. 2. Walk up stairs every day. She lived in a townhouse in Georgetown with three flights of stairs, and had her bedroom on the top floor and her kitchen on the ground floor.

When my wife, Ellen, was Director of Quaker House, next door to the Quaker Meeting House on Florida Avenue which was built luckily just in time when Herbert Hoover, a Quaker, became President of the US, Evelyn was in charge of programs for Ellen's weekly lunch for the elderly. Evelyn had retired from the US Labor Department some years ago. She had embarked on a new career of visiting places — you name it — she had been up the Nile, visited ancient ruins in Afghanistan, been all over Greece and Italy, studied the Hittites in ancient Turkey, went all over North Africa to places like Libya, Algeria, Tunisia and Egypt. She was a photographer and had color slides of all these ancient ruins for her after lunch presentations.

Several of my former bosses were present including retired Marine Corps General Earl Anderson, who had been in charge of research, development and studies when I was the Director of the Marine Corps Operations Analysis Group, a group of a dozen or so mathematicians, chemists, economists, biologists, etc. doing research on what the US Marine Corps should prepare for twenty years in the future.

Daughter Jennifer had hired a professional artist to draw caricatures of anyone who was so inclined. The artist was phenomenal in the speed with which he would capture the essence of each subject. The party provided an opportunity for some of my friends to see folks that they had not had the opportunity to see for some years. So the birthday party was big success in strengthening the bonds of friendship.

Pilgrimage To Mecca (A.K.A. Villa Griffone, Pontecchio Marconi, Italy - Birthplace Of Amateur Radio)

Friday, May 15, 1998 was a great day. I visited Villa Griffone, Guglielmo Marconi's childhood home where he carried out his amateur experiments and invented 'radio' in 1895 when he was 21-years-old. But let me begin by telling you how I got there.

My daughter, Jennifer Coile, became a Foreign Service Officer and was sent to the American Consulate in Milan for a two year tour in April 1997. My wife, Ellen, and I decided to visit her in Italy because our granddaughter, then five, was growing up so quickly. We bought plane tickets to come in April, but then Jennifer telephoned us and asked if we could come later because she had been told she was being sent to South Africa to help out at the Embassy when President Clinton arrived. So we changed our tickets to come in May. Then, Jennifer telephoned and told us she was being sent to England for a couple weeks when the President went to the G-8 Summit. We decided to come anyhow because we would see her for four days in Milan before she left to go to Birmingham.

Milan is about 120 miles from Bologna. My son-in-law John rented a car from Hertz and our expedition set off. Jennifer had received some information about Marconi from the Fondazione Guglielmo Marconi. The Foundation turned Villa Griffone (the mythological griffin) where Marconi lived as a child into a museum. The Villa is actually about nine miles from the center of downtown Bologna in a village called Pontecchio Marconi. The City of Bologna is proud of the famous inventor Marconi. There are thirteen spots on the Bologna Marconi tour that are suggested for visits, but I only visited the Villa which is a large mansion on route SS64 14km from Bologna. We actually were on the Autostrada A1 from Bologna to Firenze (Florence) and exited at Sasso Marconi.

The ground floor has a large museum with replicas of a variety of Marconi's transmitting and receiving equipment which used spark gap transmitters and coherer detectors. The floor above has Marconi's laboratory which has been restored to resemble the original 1895 condition when he sent his brother and a carpenter to carry the antenna and receiver beyond

a hill. Marconi's brother Alfonso fired a rifle after receiving the radio signal so that Marconi, at the window of the lab, could realize that the first radio transmission had been a success. Hertz, in Germany, had been able to send a signal across a room, but Marconi was the first to demonstrate that he could really transmit at long distances. Amateur radio had begun.

Marconi went to England and improved his equipment. He filed a patent application on June 2nd, 1896 and Patent No. 12,039 was issued on July 2nd, 1897 by the British Patent Office for 'Improvements in Transmitting Electrical Impulses and Signals and in Apparatus therefore.' He was 23 years old. Since both the British Post Office and the Royal Navy were interested in Marconi's radio equipment, his Irish cousin Jameson Davis helped him establish his company, called Wireless Telegraph and Signal Company on July 20, 1897. Marconi had 60,000 shares and his cousin had 10,000 of the total of 100,000 shares. The name was changed in 1900 to Marconi's Wireless Co.

Marconi was a skillful salesman and staged numerous demonstrations in England from the Isle of Wight to ships at sea, and across the English Channel from Dover to France. On July 21, 1898 he persuaded the Daily Express newspaper in Dublin to charter a steamship, the Flying Huntress, so that he could follow sailboats at sea and send the results of sailing races to his radio station on shore so that the results could be published in the evening editions of the paper. And of course, he captured the world's attention on December 12, 1901 when he successfully transmitted a transatlantic radio signal from England to Newfoundland.

So – any hams who get to Italy should consider making a pilgrimage to Bologna where amateur (and commercial) radio began. You should allow enough time to see the other places I didn't, such as: 3) the Bologna Conservatory where his Irish mother came to study singing (but married Marconi's father instead), 4) the house where Guglielmo was born on April 25, 1874, 5) the Baptistery of St. Pietro where Guglielmo was baptized, 7) the Elementary school at Casaleechio di Reno attended by little Guglielmo, and St. Petronio, the Cathedral of Bologna in Piazza Maggione where the official funeral of Marconi was held in 1937.

The Foundation has an amateur radio station, IY4FGM, at Villa Griffone. Actually there was no one from the Foundation there when we arrived from Milan. We were lucky to meet someone from the Research Center for Radio-Communications, Department of Electronics, Information and Systems,

University of Bologna at Villa Griffone who opened the museum for us and took us around.

State Department's GDIN – Global Disaster Information Network

I was asked to join a State Department group being organized by Larry Raeder at the behest of Vice President Al Gore. I attended a meeting in Washington, D.C. and then another in Mexico City.

Ellen accompanied me to Mexico City and was part of the group. There were some interesting meetings. At one time the Mexicans said the United States should take care of all their hurricane damage. Ellen pointed out they should be doing mitigation themselves, like the Florida School District who got tired of replacing classroom furniture and equipment (like computers) every time they had a hurricane. The damage was caused more by water than anything else. The buildings weren't destroyed but the windows were blown in and the rain caused the damage. After several times of this happening they installed super shutters built to withstand hurricanes. It worked like a charm, and although the shutters were super expensive, they were a one time charge.

There was a bus tour to see the results of an earthquake but we were warned that it would be very dusty, so I decided I shouldn't go as I have breathing problems.

Instead, we took a tour of Mexico City, the cathedral, art museum, etc. We saw some acrobats who were pulled up to the top of a 100-foot pole and were spun around hanging by one ankle until they slowly reached the ground.

The next meeting was held in Ankara, Turkey. The whole premise of GDIN was to use information from military satellites for emergency relief efforts at times of earthquakes, hurricanes, forest fires, etc. Vice President Gore was really behind it and if he had won the election it would have really taken off. Without his support, GDIN withered.

A Professional Exchange Visit To China

Arranging A Professional Exchange

In October 1996 the National Center for Earthquake Engineering (NCEER) at the State University of New York, Buffalo published a request for proposals for researcher exchange visits between the United States and the People's Republic of China to be sponsored by the National Science Foundation. In Pacific Grove we decided to take advantage of this program to extend our own knowledge and establish and renew contacts with the Chinese disaster research community. These grants are usually awarded to researchers at universities such as Stanford or the California Institute of Technology and it might be unusual for someone working at a fire department to receive such a researcher exchange travel grant. Through a fortuitous set of circumstances, however, it appeared that Pacific Grove might be eligible.

The Federal Emergency Management Agency had given national recognition to Pacific Grove in May 1997 in an article, 'Pacific Grove - A Model City for Disaster Preparedness,' which appeared in the Compendium of Exemplary Practices in Emergency Management. In addition, the January 1997 issue of the Journal of the American Society of Information Science contained a paper on an analysis of citations and translations in Chinese library and information science literature. Citation data had been collected from seven major Chinese journals in library and information science published between 1983 and 1990. My name was listed in two appendices concerning groups of the most heavily cited and translated authors. What a surprise to see a paper that I had written in 1977 in my starving student days when I was working on my Ph.D listed as heavily cited! I immediately wrote to the NCEER to point out that the Chinese had found my earlier research useful and that I hoped that some seismologists in Beijing would be given a travel grant to come to Pacific Grove to find out about the useful things in earthquake preparedness that I was now doing!

A proposal was submitted to the NCEER for exchange visits by Chinese earthquake researchers to visit Pacific Grove to learn how a small California city prepares for earthquakes and for the Pacific Grove Fire Department's

disaster coordinator to visit China for two weeks to learn how the Chinese prepare for earthquakes.

The NCEER approved my proposal with the stipulation that the travel must be completed before February 28, 1998. I therefore suggested visiting the Chinese Academy of Sciences during the period of October 20-31, 1997. The Pacific Grove City Manager invited the Chinese to visit Pacific Grove during the first two weeks of April 1998 so that they could observe the City of Pacific Grove's participation in the State of California's annual earthquake exercise, usually scheduled for the first Tuesday in April. The Chinese Academy of Sciences sent me an invitation by e-mail to show to the Chinese Consulate in San Francisco when I applied for my visa. The American Embassy in Beijing was notified by cable of my visit to the Chinese Academy of Sciences.

Not All Things Work Out

An inquiry had also been made to the Chinese Academy of Sciences for a possible visit to the Shanghai Anti-Disaster and Relief Office on October 9-10 before visiting the Center for Disaster Reduction of the Chinese Academy of Sciences in Beijing. I had met some of the five members of the Shanghai delegation to the 2nd International Conference of Local Authorities Confronting Disasters and Emergencies held in Amsterdam in April 1996 when I presented a paper there. Even in organized exchange visits, however, not all things turn out as expected. When I arrived in Shanghai and contacted the Anti-Disaster and Relief Office, the visit could not take place because of the absence of an interpreter.

Center For Disaster Reduction

The Center for Disaster Reduction of the Chinese Academy of Sciences was established in 1995. The Center's headquarters is located at the Institute of Atmospheric Physics in Beijing. It is a union of more than forty organizations which are engaged in disaster reduction activities. There were 47 research projects underway in 1996.

I gave a seminar on 'Emergency Preparedness for Earthquakes in California' on October 28th at the Center for Disaster Reduction. The Director, Professor Wang Ang- Sheng, is also the Director of the Experts Group of the Chinese National Committee for the International Decade for Natural Disaster Reduction. He and Dr. Qian Ye (who received his Doctorate from Oregon State University) and Dr. Dong Jiarui assisted in arranging other

visits for me. A number of representatives of the Institute of Atmospheric Physics, Institute of Geology, and the Institute of Crystal Dynamics also participated in the seminar, and my wife, Ellen, also discussed how neighborhood emergency response teams are organized. Their research community has outreach problems with their administrative community and the Chinese research community seemed glad to hear of the grass-roots public education efforts which emphasize the individual homeowner's taking more responsibility for preparedness.

A small collection of American preparedness literature was presented to the Center for Disaster Reduction. This included copies of publications from various US sources, such as the NCEER, ERRI, the state of California, FEMA, the American Red Cross, IAEM, and public disaster information from several Monterey County organizations. We take much of this information for granted, but there is little access to it overseas, just as foreign literature is not readily available here. This type of literature is very much appreciated when making visits to foreign organizations. Numerous Chinese research publications were given to me. Chinese research into natural disaster precursors and prediction seem promising and would seem to be worth investigating.

Professor Wang Ang-Sheng, Director of the Center, arranged for me to visit the Institute of Atmospheric Physics and the Institute of Geology. I also visited Peking University and Beijing Polytechnic University and met scientists from the Institute of Geophysics and Institute of Crustal Dynamics, State Seismological Bureau, and visited Tangshan, the city which suffered China's worst earthquake disaster in this century.

Visit to Tangshan

Dr. Dong Jiarui took me to visit the city of Tangshan, about 90 miles from Beijing. A magnitude 7.8 earthquake occurred at 3:42 am on July 28, 1976 which resulted in 240,000 deaths in the city. The Peoples Liberation Army responded with 100,000 troops to rescue survivors, treat the injured, build temporary shelters, and feed the earthquake victims. The rebuilding of the city was a classic case of forced urban renewal. The city is now a showcase since most of the buildings are now only ten to 15 years old and the streets are wide with attractive landscaping using many trees and flowers. There is a comprehensive earthquake museum which documents the disaster and the rebuilding of the city.

Chinese Research On Precursors And Prediction

It is curious that research on alternative non-seismological approaches has apparently not been taken seriously in the United States. Large disturbances of the earth's magnetic field have been observed shortly before devastating earthquakes such as the 'Good Friday' earthquake in Alaska. The observations were reported in a distinguished scientific journal, but since then they have been almost universally ignored in discussions of the possibility of predicting earthquakes.

I was impressed with the Chinese approach of examining magnetic observatory records to see if there were any precursor indications associated with earthquakes. The United Nations is interested in exploring this approach and had scheduled a workshop for representatives from magnetic observatories in about 15 different countries to come to Beijing for a week in February 1998. The Chinese researchers demonstrated three different methods of analysis of geomagnetic data so that each magnetician could go home and examine his data for precursors of local earthquakes.

It would appear that Chinese research on earthquake precursors and prediction should be looked at seriously in the United States since the combination of several alternative methods seems to have indicated the potential of empirical prediction for large earthquakes even where physical understanding is lacking. It may be prudent and worthwhile for researchers in the United States to investigate some of these alternative non-seismological approaches.

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Notes

Russell C Coile, Ph.D, CEM has been the disaster coordinator/emergency program manager at the Pacific Grove Fire Department for the past eight years. He received SB, SM, and EE degrees in electrical engineering from M.I.T., Cambridge, Mass. and a Ph.D in information science from The City University, London, England. He is a Fellow of the Institute of Civil Defence and Disaster Studies, London.

Disaster Preparedness In Pacific Grove 1999 Annual Report

DISASTER PREPAREDNESS IN PACIFIC GROVE 1999 ANNUAL REPORT, Russell C. Coile, Ph.D, CEM, Emergency Program Manager, January 24, 2000

Preparing Pacific Grove For Earthquakes

Earthquake Training

A team of city employees attended the 'Earthquake' training course at the California Specialized Training Institute, San Luis Obispo. This January 11-15, 1999 emergency management course was attended by Scott Miller, Police Chief, Stephen Leiker, Public Works Director, Judith MacClelland, Chief Planner, Polly Fry, Fire Department Administrative Secretary, and Julie Uretsky, Housing Program Assistant.

State-wide Earthquake Exercise

Planning began in January, 1999 for the City's participation in California's annual state-wide earthquake exercise scheduled for April 1999. This was the tenth year that the City had participated. The State's exercise was conducted on Tuesday, April 6 at 10:30 a.m. Members of the City's Disaster Council participated, including representatives from the Pacific Grove Chamber of Commerce, radio station KAZU, Pacific Grove Unified School District, Asilomar Conference Center, and Cal-Am Water. Boy Scouts delivered messages in the emergency operations center, and amateur radio operators in the EOC communicated with hams at the County's EOC, Carmel-by-the-Sea Red Cross chapter and Salvation Army in Seaside. Stanford University's Hopkins Marine Station conducted their annual earthquake evacuation drill. TV stations KSBW and KION filmed EOC activity for their 6 p.m. and 10 p.m. news broadcasts. A discussion of preparedness for the Y2K conversion event was also presented by a planner from the Monterey County Operational Area.

Seismic Performance of Buildings

The Emergency Program Manager obtained a report, 'Incentives and Impediments to Improving the Seismic Performance of Buildings' for the

City Manager and the Community Development Department. This report was prepared by the Earthquake Engineering Research Institute (EERI) for the Governor's Office of Emergency Services with funding support from FEMA. The report discussed the roles of various stakeholder groups who should be involved in identifying how best to motivate building owners to improve the seismic performance of their buildings.

Improving Woodframe Building Performance

The Emergency Program Manager obtained information for the Community Development Department on a new project which should be of value to Pacific Grove residents who live in wooden houses. The Federal Emergency Management Agency and the California Office of Emergency Services have announced the award of $5.2 million to the California Institute of Technology for research on improving woodframe building performance in earthquakes. The project, 'Earthquake Hazard Mitigation of Woodframe Construction' will include work contracted to universities other than Caltech managed by California Universities for Research in Earthquake Engineering (CUREe). CUREe includes in addition to Caltech, University of California campuses at San Diego, Los Angeles, Irvine, Davis and Berkeley, the University of Southern California and Stanford University. The CUREe-Caltech Woodframe Project Newsletter, No.1, November 1998 described the project and contained a form which invited anyone interested to fax or mail the form to be included on the mailing list for future copies of the newsletter.

California's Disaster Information System

The Emergency Program Manager attended a two-day training course on the State's new disaster information system at the California Specialized Training Institute, San Luis Obispo. The computerized 'Resource Information Management System (RIMS)' has replaced the manual reporting forms formerly used for the State's Operational Area Satellite Information System (OASIS). All Operational Areas and cities in California must use RIMS formats from now on to report incidents and request assistance in disasters. The Monterey Operational Area informed us in December 1999 that the State Office of Emergency Services had made arrangements for cities to get access on the Internet to the State's Resource Information Management System (RIMS). Pacific Grove OES was invited to apply for an ID and a password. Our request was sent to the Operational Area which approved it

and forwarded it to OES Coastal Region. OES Coastal Region notified us that it approved the request and sent it to State OES in Sacramento which issued the City of Pacific Grove an ID and password. We are now prepared to use the RIMS system on the Internet to report any type of disaster and participate in this new computerized system for passing information and requests for assistance to the Monterey Operational Area, Salinas, OES, Coastal Region, Oakland and to the Governor's Office of Emergency Services, Sacramento.

Volunteers in Preparedness

The first of four refresher training classes for Volunteers in Preparedness (VIP) graduates was held at the Community Center on July 29, 1999 from 7 to 9 pm. Mayor Sandy Koffman was the keynote speaker. An educational game featured on a FEMA-sponsored virtual conference on the Internet was used in the VIP training session to brainstorm solutions to possible problems in a disaster, such as no electricity, no water, etc. The game was designed to illustrate how many different solutions there may be to possible problems, so that the public can be educated to avoid panic. One of the volunteers gave a talk on how a VIP might survey his or her neighborhood in order to find out which residents might have special skills, such as retired nurses, and which residents might have disaster equipment, such as crowbars, or wrenches to turn gas meters off, or emergency power supplies, etc. Another volunteer who is an amateur radio operator gave a briefing on the role of amateur radio in disasters for emergency communication. There may be difficulties with 911 or the telephone system in earthquakes. Another volunteer gave a talk on the training of urban search dogs here in Pacific Grove who can be used to search for survivors in earthquake damaged houses.

The second training class in this series was held on September 8, 1999. The recent earthquake in Turkey with thousands of residents killed and 500,000 homeless had reminded us of the destructive power of an earthquake. Therefore, Pacific Grove uses worst-case earthquake scenarios for the training of our volunteers. If we are prepared for people killed and injured as well as houses destroyed, no PG&E electricity, no gas, no water, no sewer, no Pacific Bell telephone, roads damaged, etc, Pacific Grove will be prepared for anything, including any possible Y2K problems. Earthquake preparedness and mitigation actions were reviewed.

The third class was a special training exercise. All Pacific Grove Volunteers in Preparedness graduates were invited to attend a field training exercise on Saturday, September 25 in Monterey. The Monterey Fire Department's Neighborhood Emergency Response Teams (NERT) had invited Pacific Grove VIPs to participate in their field exercise at the Casanova Oak Knoll Community Center, 735 Ramona Avenue, Montgerey. The scenario included a variety of incidents for the NERT teams to cope with. Three streets were blocked off for the exercise and 50 home owners gave permission for disaster incidents to be staged on their property. There were more than 30 victims moulaged with theatrical makeup to look as if they were bleeding to death, or with broken bones, or in shock, etc. Some victims were buried under (pretend) earthquake rubble who had to be saved by careful cribbing to get them out. There were (pretend) downed power lines, (actual) small fires to be put out, (pretend) broken gas pipes which required the gas to be turned off at the gas meter, lost children, anxious parents, (pretend) vehicle accidents, etc. The exercise began at 7 a.m. and was completed at noon. Pacific Grove VIPs played the role of convergent volunteers coming out of the neighborhood to help the NERT teams.

The fourth VIP refresher class was held on November 16, 1999. This class again emphasized earthquake preparedness since the US Geological Survey on October 14, 1999 published a revised forecast of possible earthquake activity in the future in the San Francisco Bay area The new forecast increased the chance of a big earthquake in the next 30 years to 70%. This indicated that Pacific Grove is on the right track to organize the City's response teams now. Volunteers had been instructed to bring their VIP vest and hardhat to class. Also, they were asked to bring their disaster backpack containing at least one item they would carry with them if an earthquake came at night and they rushed out to check on the neighbors across the street (such as a flashlight, crescent wrench to turn off the gas, crowbar, fire extinguisher, first aid kit, etc).

YEAR 2000 PREPAREDNESS

Throughout 1999, the Emergency Program Manager collected relevant disaster preparedness information on possible Year 2000 (Y2K) conversion problems for Anthony Lobay, Director of Special Projects who was in charge of the City's Y2K conversion. Some of the information collected included:

The President's Council on Year 2000 Conversion introduced a new toll-free Y2K information line on January 7, 1999. The number was 1 888

USA-4 Y2K (1 888 872-4925). Information specialists staffed this line from 9 a.m. to 8 p.m. (EST), Monday-Friday. Pre-recorded information was available seven days a week, 24 hours a day.

Copies of three new Federal Trade Commission publications for consumers on Y2K were requested from the FTC's Consumer Response Center. These were: a) Preparing Your Personal Finances for the Year 2000, b) Consumer Electronic Products, and c) Information Technology and Home Office Products.

Information was obtained on a Y2K training workshop for people responsible for Y2K affairs scheduled to be held in San Francisco on February 10, 1999.

The Governor's Office of Emergency Services sent us 'The Year 2000 (Y2K): Recommended Local Government Planning Action' which provided guidance to local governments in addressing Y2K issues. The Coastal Region Y2K Coordinator notified us that he would be scheduling briefings on Y2K issues during the spring.

The International Association of Emergency Managers (IAEM) published 'Inoculating Ourselves Against the Y2K 'Bug' in IAEM Bulletin, Vol.16, No.1, January 1999. There were a number of interesting articles including one on FEMA's role and another which listed Y2K information on the Internet.

The Red Cross issued a Y2K Preparedness Checklist which contained many of the same recommendations as promulgated for winter storms or earthquake preparedness, e.g. 'Have plenty of flashlights and extra batteries on hand.

The Internet continued to publish progress reports on Y2K activities. Some recent items were: Remarks by Kay Goss , FEMA - Catastrophic Disaster Response Group Meeting, December 16, 1998; and Remarks by Kay Goss, FEMA - Emergency Services Sector Meeting, The President's Council on Year 2000 Conversion, November 19, 1998.

The President's Council on Year 2000 Conversion sent a package of suggestions for organizing 'Community Conversations' which included a video of President Clinton introducing the Y2K issue. Harry Robins, Monterey Operational Area, sent over several hundred copies of a new Y2K brochure prepared by the State Office of Emergency Services.

The Emergency Program Manager collected information for the City Manager/Director of Emergency Services and the City's Y2K Project Manager on the preparations being made by the Community Hospital of the

Monterey Peninsula to prepare for any possible Y2K problems.The hospital has had a task force which has made an inventory of all computer software and hardware and reviewed all computers and systems to be sure that they are Y2K-compliant. Systems were upgraded or replaced as necessary. The hospital conducted a series of internal exercises the last week of May and the first week of June 1 to test all systems.

The Emergency Program Manager had been asked by Community Hospital to provide technical advice as to what amateur radio equipment the Hospital should buy to install a station for backup emergency communications. The emergency manager organized several members of the Naval Postgraduate School Amateur Radio Club to provide the appropriate information, install the equipment, and operate the amateur station at the hospital on December 16, when the Community Hospital participated in a state-wide exercise of emergency communications for hospitals. The Emergency Program Manager was one of the amateur radio operators taking a shift at CHOMP during the Y2K emergency period on December 31, 1999.

The Pacific Grove Police Department activated its emergency operations center at the Police Conference Room at 5 pm on December 31, 1999. The Emergency Program Manager set up an amateur radio station in the EOC for emergency backup communication with the county and other cities such as Monterey and operated there until about 12:30 am.

RED CROSS

Carmel-by-the-Sea American Red Cross Chapter

The Emergency Program Manager attended the regular monthly meeting of the Disaster Services Committee of the Carmel-by-the-Sea Red Cross Chapter on July 20, 1999. It was reported that the American Red Cross Chapter in the San Francisco Bay Area had a meeting on May 21 to plan for a big earthquake in the San Francisco area on the Hayward fault. It had been estimated that a big earthquake might cause more than 20,000 people to become homeless. The Red Cross is beginning to plan for large scale disasters where there may not be enough undamaged high school gyms or other suitable places which might be turned into shelters for thousands of earthquake victims. People might prefer to 'camp' in their own damaged homes if the Red Cross could provide food or feed them. It is interesting to note that in Pacific Grove both the Asilomar Conference

Center and the Senior Center's Meals on Wheels have emergency power generators and could feed large numbers of our City's earthquake victims, if necessary.

Monterey County American Red Cross Chapter

The Emergency Program Manager attended the joint meeting of the Montery County Chapter, Salinas of the American Red Cross and the Carmel-by-the Sea Red Cross Chapter at the Presidio of Monterey on December 14, 1999. The purpose of the meeting was to discuss the planning for Red Cross response to a large-scale catastrophic earthquake in our county.

Chinese Red Cross

The Emergency Program manager met two Chinese Red Cross representatives at a conference on February 7, 1999 in Monterey. He made arrangements to take them on February 9 to visit the Carmel-by-the-Sea

American Red Cross chapter and meet the Executive Director for discussion of Red Cross activities in China.

MISCELLANEOUS

Governor's Office of Emergency Services, Coastal Region

The Emergency Program Manager attended a meeting of the State OES, Coastal Region and California Emergency Services Association in San Jose on January 29, 1999. Information was obtained for the Pacific Grove Fire Department on a new 'QuakeAlert' earthquake alarm device. This earthquake actuated alarm might be of value in giving some seconds of alerting time to permit opening firestation doors in the event of a destructive earthquake.

FEMA Training

The Emergency Program Manager attended a FEMA course, 'Mitigation for Emergency Managers' at the Benicia Fire Department on February 22-24, 1999. In addition to the helpful training, a guest speaker gave a talk on the city of Oakland's mitigation activities in 1998. Oakland was given a FEMA grant to be a pilot city for FEMA's mitigation program called 'Project Impact.'

Operational Area Working Meetings.

The Emergency Manager of the Monterey County Operational Area on September 1, 1999 invited comment from Pacific Grove on possible actions to improve communication between the Operational Area and cities and special districts in order to make the entire Monterey County Operational Area a more cohesive organization. The Emergency Program Manager provided comments supporting the proposal for regular working level training sessions.

FEMA's Project Impact Grant Program

The Governor's Office of Emergency Services, Coastal Region notified the City of an opportunity to apply to participate in FEMA's Project Impact Grant Program. A request for a FEMA grant was prepared and submitted by the City of Pacific Grove. The Fire Department's 'Project Smoke Alarm' was presented as an example of how the City had already been doing things on its own in the spirit of FEMA's program to form partnerships between the local government and the local community. However, FEMA awarded only one grant in each state and the city of Berkeley received the grant for cities in California.

Winter Storm Warning

The Emergency Program Manager prepared an article on winter storm preparedness which was published on February 12 in the Pacific Grove Chamber of Commerce's Newsletter Disaster Preparedness Information for the Blind, the Emergency Program Manager attended a virtual conference sponsored by FEMA on the Internet on the subject of disaster preparedness for the disabled. Some relevant information on disaster preparedness for the blind was obtained and given to the Director of the Center for the Blind and Visually Impaired of Monterey County, 225 Laurel Avenue, Pacific Grove.

Certified Emergency Manager Commission

The Emergency Program Manager, a Commissioner, attended three meetings of the Certified Emergency Manager Commission on the East Coast during 1999. The Commision reviews applications for certification as Emergency Managers. It was initially established through a FEMA initiative and is now administered by a professional society, the International Association of Emergency Managers.

DISASTER PREPAREDNESS

(Note: The Pacific Grove Fire Department received national recognition in 1997 when FEMA selected 'Pacific Grove - A Model for small City Disaster Preparedness' for inclusion in its annual report, *Partnerships in Preparedness - A Compendium of Exemplary Practices in Emergency Management*, Volume II, page 25, May 1997. Because of this, the Emergency Program Manager was invited to participate during 1999 in a number of relevant activities.)

Pacific Information-Sharing Forum

The Emergency Program Manager was invited to give a paper, 'Preparing for and Coping with Local Disasters' at the Pacific Information-Sharing Forum conference in Monterey, 7-10 February, 1999. The conference brought together local government, State Department, military and civilian representatives interested in humanitarian disaster relief operations. The Emergency Program Manager invited the State Department rep to visit the Pacific Grove Fire Department where he met Assistant Fire Chief Andrew Miller and Police Captain Bill Kennedy.

Pacific Disaster Center

The Emergency Program Manager was invited to attend the Emergency Managers' User Conference, April 28-30, 1999 at the Pacific Disaster Center in Maui. This meeting was sponsored by FEMA, Department of Defense, State of Hawaii, and National Weather Service. Each emergency manager was asked to give a brief report on user needs. Pacific Grove's disaster information needs included such things as imagery from satellites about ocean oil spills which might be advancing towards Pacific Grove's coastline. Similarly, information from satellite detection of a fire in the Del Monte Forest might be valuable if the fire is advancing towards Pacific Grove.

Humanitarian Relief Exercise in Monterey

The Emergency Program Manager was invited by the Assistant City Manager of the city of Monterey to attend a planning meeting on 12 January 1999 at the Naval Postgraduate School for the exercise scheduled to be conducted on March 13 at the city of Monterey, Naval Postgraduate School, and Presidio of Monterey. The exercise was designed to test U.S. Marine Corps capabilities to conduct humanitarian operations in a foreign country (Monterey). The City of Monterey's new emergency operations center would

be activated, the Defense Language Institute (DLI) would have a liasion rep at the EOC and the Marines would send their Civil Affairs Group there. The Monterey Fire Department would send one fire engine from Station 2 to DLI and would probably ask the Pacific Grove Fire Department to send one engine to DLI.

Humanitarian Relief Exercise in Oakland

The Emergency Program Manager was invited to be an exercise evaluator in Oakland on March 16 and 17 at the emergency operations center of the Governor's Office of Emergency Services, Coastal Region. A U.S. Marine Corps humanitarian relief exercise was designed to test Marine Corps capabilities to conduct humanitarian and peace keeping operations in a foreign country. The Marines set up a portable hospital, sleeping and feeding facilities for (pretend) earthquake victims in Oakland. There were a number of communication problems between the State OES and the Navy/ Marine Corps command ship in San Francisco harbor.

TERRORISM

(Note: The Pacific Grove Fire Department received national recognition in 1998 when FEMA selected Pacific Grove's 'Partnership for Preparedness Against Terrorism' for inclusion in its annual report, *Partnerships in Preparedness - A Compendium of Exemplary Practices in Emergency Management,* Volume III, page 15, October 1998. Because of this, the Emergency Program Manager was invited to participate in a number of relevant activities.)

FBI Meeting

The Emergency Program Manager was invited to attend a meeting on January 27, 1999 in San Jose of the Bay Area Terrorism Working Group to hear the FBI describe some recent counter-terrorist actions. A PG&E employee had been arrested in connection with bomb making activities.

Alameda County Exercise

The Emergency Program Manager was invited to be an evaluator at the Oakland Childrens' Hospital on May 18, 1999 for a terrorism exercise involving all 13 hospitals in the county.

Thesis Review

The Emergency Program Manager was asked by the Naval Postgraduate School to review the draft of an Army student's Master's thesis on terrorism which used data collected during a multi-casualty exercise with 65 victims conducted by the Pacific Grove Fire Department in November, 1997. The Naval Postgraduate School had requested permission to observe the exercise and collect data, such as the time it took to load victims into ambulances for transport to hospitals.

San Francisco Terrorism Exercise

The FBI and the Governor's Office of Emergency Services, Coastal REgion have a terrorism meeting in San Francisco every two months. The Emergency Program Manager was invited to attend and observe the July 8, 1999 terrorism exercise at the Civic Center in San Francisco.

Terrorism Book Review

FEMA's Emergency Management Institute at Emmitsburg, Maryland has a program of assisting universities all over the country to establish college level courses on emergency management. As a part of this program, FEMA has commissioned college professors to write textbooks on emergency management topics. The Emergency Program Manager was invited to review the draft of a textbook on terrorism.

National Fire Academy Self-Study Course

The Emergency Program Manager downloaded a self-study course from FEMA's Internet webpages for the Pacific Grove Fire and Police Departments. The course, 'Emergency Response to Terrorism: Self-Study (ERT:SS)(Q534) was released in June 1999.

PROFESSIONAL OUTREACH

(Note: The Pacific Grove Fire Department received national recognition in 1999 when FEMA selected 'Pacific Grove Fire Departments's Public Education and Professional Outreach Programs for Disaster Preparedness' for inclusion in its annual report, *Partnerships in Preparedness - A Compendium of Exemplary Practices in Emergency Management* , Volume IV, 1999. Because of this, the Emergency Program Manager was invited to participate in a number of relevant activities.)

Global Disaster Information Network

The Emergency Program Manager was invited by the U.S. State Department to present a paper at an international conference on the 'Global Disaster Information Network (GDIN)' held in Mexico City in May. After the Mexico City meeting, the Emergency Program Manager was invited to be chairman of a working group (on the Internet) to examine the role of local communities in the Global Disaster Information Network.

Citizens' Police Academy

The Emergency Program Manager gave a talk on disaster preparedness on May 24,1999 to the class of students in the Pacific Grove Police Department's Citizens' Police Academy.

Professional Society talk

While on vacation, I attended the annual conference of The Emergency Management Society (TIEMS) at Delft Technical University, Delft, The Netherlands. On 11 June 1999, I presented a paper, 'Natural Disaster Reduction Efforts at the Local Government Level in the United States.'

Virtual Forum on the Internet

On 23 June 1999, I participated in a live Internet Forum hosted by the Emergency Information Infrastructure Partnership (EIIP). The EIIP is sponsored by the Federal Emergency Management Agency. The speaker was Mr. Philippe Boulle, Director of the United Nations' International Decade of Natural Hazard Reduction Secretariat. This was the third year of IDNDR activities on the Internet. I had presented a paper in 1996 in the first of the IDNDR virtual conferences.

United Nations Virtual Conference

The Emergency Program Manager participated on the Internet on July 7, 1999 in a United Nations Virtual Conference on the International Decade of Natural Hazard Reduction. The executive secretary of the 'Global Forum of NGOs for Disaster Reduction' in India had proposed that teams of volunteers to help in disasters be established all over the world. I sent in comments on his proposal, which were published by the United Nations. I pointed out that our City of Pacific Grove already had a program called, 'Volunteers in Preparedness' which is similar to his proposal. I gave a reference to the FEMA website which describes the Community Emergency

Response Teams program which FEMA has developed based on the San Francisco Fire Department's Neighborhood Emergency Response Teams.

Hazards Workshop

The Emergency Program Manager was invited by the Natural Hazards Reasearch and Applications Information Center at the University of Colorado to participate in their annual Hazards Workshop in Boulder, July 11-14, 1999. The Center is supported by FEMA, NSF, NOAA, USGS and other government agencies concerned with disaster. James Lee Witt, FEMA director was the key note speaker. The Emergency Program Manager presented a poster paper, 'Progress on the Development of the Global Disaster Information Network.'

A Yank At Easingwold, England

A YANK AT EASINGWOLD
Russell C. Coile, Ph.D, CEM
Pacific Grove Fire Department Pacific Grove, California

ABSTRACT

The British Home Office has its Emergency Planning College at Easingwold in North Yorkshire, England. I had the opportunity to visit the College and attend a course there in September 1993. I had attended a similar type of course at FEMA's Emergency Management Institute at Emmitsburg, Maryland and I thought it might be interesting to compare the two approaches. My Emmitsburg course was *E 200 Disaster Preparedness Seminar* and the Easingwold course was *Seminar for Elected Members.* The participants at Emmitsburg were teams of two people - the local government City Manager and his or her Emergency Coordinator, for example. The participants at Easingwold were 'elected members' - chairmen of councils, and leaders of principal political parties.

Introduction

Years ago, Mickey Rooney starred in a movie entitled 'A Yank at Oxford.' I don't really remember much about the movie except that Mickey apparently did everything wrong in England on every possible occasion. Since I was born in Washington, D.C. and am as American as apple pie, I was somewhat apprehensive about going to England to participate in a seminar at the Home Office's Emergency Planning College at The Hawkhills, Easingwold, North Yorkshire. Besides, I usually read Dave Barry's articles in our Sunday paper. Dave apparently visited England some time ago and wrote a frightening account of his problems when confronted with a typical English place setting at a formal dinner which he said consisted of 27 knives, forks, and spoons. Anyhow, I decided to chance it.

The Home Office bought 'The Hawkhills', a large country house at Easingwold in 1936' for conversion for use as an 'anti-gas training school.' British preparations for World War II included preparing for the use of poison gas by Germany, since there had been so many chemical warfare

casualties in World War I. The house and its 350 acre estate were purchased from Joseph Love, a Durham coal magnate for only £12,500. The first civil defense course at The Hawkhills, Easingwold was in December 1937, so that the College celebrated its 50th anniversary in 1987.

The Hawkhills became the Home Office's only Civil Defence College in 1968 when the two other civil defense schools were closed. In 1989, the Home Secretary reviewed the subject of civil emergencies and decided to rename the College 'The Emergency Planning College,' and modified its responsibilities to address questions of peacetime disasters as well as wartime emergency civil defence planning. The Emergency Planning College has a Principal, Vice- Principal, College Secretary, three Programme Directors, ten Study Leaders, and a Librarian. The College will present about thirty different residential seminars and courses in 1994-1995 as listed in the Appendix.

After arriving in London, I took a fast train from King's Cross railway station to York. The College provided transportation to The Hawkhills which is situated ten miles north of York and about one mile south of the village of Easingwold. The original country house has been added to and modernized so that it now has residential study/bedroom accommodations for about 70 on site and conference facilities for 125 or so. In addition to a gym, weight room, croquet, etc there are two woodland jogging paths marked by red or white arrows. I saw a number of rabbits and even a fox on my walks.

Seminar Participants

The seminar at the Emergency Planning College, Easingwold that I attended was for 'elected members.' Apparently all elected members are eligible to attend but preference is given to chairmen (convenors) or vice chairmen of councils, leaders or deputy leaders of principal political parties, and chairmen or vice chairmen of relevant committees. The participants at this seminar included: the Deputy Mayor, Salisbury District Council, Wiltshire; Vice Chairman, Stroud District Council, Gloucestershire; two members of the Orkney Islands Council; Deputy Mayor, Coleraine Borough Council, County Londonderry, Northern Ireland; member of City of Dundee District Council, Tayside, Scotland; etc.

When I attended the seminar at the Emergency Management Institute, Emmitsburg, Maryland, the participants came from all over the States and consisted of teams of two people - the local chief administrator (Mayor,

City Manager or County Manager) and his or her Civil Defense Director, Emergency Manager, or Emergency Coordinator.

Seminar Objectives

The Elected Members' Seminar at Easingwold had the following learning objectives: to understand the current rationale for emergency preparedness and the factors which have influenced it; to be aware of the roles and responsibilities of the emergency 46 services, local authority services and other agencies and organizations in their response to peacetime emergencies; to gain a broad understanding of radiation and an understanding of the response to nuclear-related emergencies; and to be aware of the responsibilities of elected members concerning emergency preparedness and to be aware of the legislative and financial framework for emergency preparedness and current programmes and initiatives.

The E 200 Disaster Preparedness Seminar at Emmitsburg had the following objectives: identify emergency planning problems and needs in the participant's own municipality; develop a coordinated team approach to emergency planning; improve the management of and support for their emergency planning teams; understand the basic concepts of crisis management; and complete an evaluation of their local emergency preparedness program.

Learning Approach

At Easingwold, we were divided up into 'syndicates' of about eight people with an assigned tutor. The tutor for our syndicate was a Police Superintendent who had been 'seconded' to the college for a two year assignment to be a study leader and to give lectures. The briefings, group and plenary discussions and a discussion-based exercise were combined to give members an opportunity to discuss the problems which might confront local authorities in a range of emergencies. Some of the briefings presented to us were: Common Elements of Crises Local Authority's Resources Available in Emergencies; Uniformed Services' Resources Available in Emergencies; What can we Expect from the News Media; Procedures at Major Incidents; and Principles of Integrated Emergency Management.

The seminar ended with a case study of a recent emergency - the bombing of the PanAm aircraft at Lockerbie, Scotland. The speaker, a member of the Dumfries and Galloway Regional Council, explained his role and the actions taken by his authority.

At Emmitsburg, our seminar addressed the following functional areas with lectures, videotapes, group and individual exercises as indicated: The nature and pervasiveness of disaster; Lecture and videotapes on Preparedness; The need for leadership in disaster planning and response; Introduction to Disaster Planning and Management; Hazard analysis; Local Hazard Analysis questionnaire; the essential elements of disaster management; Disaster Case Analysis; Securing interorganizational participation and cooperation; Establishing and Maintaining Interorganizational Relationships and Cooperation Disaster Case Analysis; The functions of the Emergency Operations Center and effective utilization of the Incident Command System; The EOC: Place and Process; Crisis decision-making techniques; Improving Crisis Decision-making & How Miamisburg Averted Disaster; The characteristics of an effective disaster management organization; The Local Emergency Preparedness Team Evaluation; An action plan for improving disaster preparedness; The Local Emergency Preparedness Program Action Plan & Meeting the Media.

Comparison

As you can see, the British and American seminars had many aspects in common as well as some different approaches. I guess that I was surprised to hear the discussion of so many different kinds of actual disasters in England of one sort or another. I thought that we here in California had more of everything, whether it be earthquakes, tsunamis, wild land fires, drought, hazardous chemical spills, etc. even if we didn't have Hurricane Andrew, the Mississippi River floods, tornadoes or blizzards like the great Northeast Blizzard of '93.

Conclusion

In my opinion, FEMA and the Home Office should explore whether or not some form of occasional temporary exchange of instructors might be worthwhile between the Home Office's Emergency Planning College at Easingwold and FEMA's Emergency Management Institute at Emmitsburg. The U.S. Defense Department has apparently found some way to have British Artillery officers teach on an exchange basis at the U.S. Army's Artillery School at Fort Sill, Oklahoma and to have Royal Marine officers teach at the Marine Corps Schools at Quantico, Virginia, while U.S. Marine Corps officers teach on exchange duty in England.

It would seem appropriate for FEMA and the Home Office to consider whether or not temporary exchanges of instructors between Emmitsburg and Easingwold might be cost-effective for both 'us' and 'them' to study and learn each other's different approaches for similar kinds of emergencies.

Emergency Planning College Seminars and Courses

Taken from *Emergency Planning - Course directory, conference and study facilities 1994-95,* The Emergency Planning College, Easingwold, York Y06 3EG, Tel: 0347 821406; FAX: 0347 822575

The Emergency Planning College, Easingwold will offer the following seminars in 1994-95:

Aspects of Emergency Planning for National Health Service

Management of major emergencies in the NHS context with a participative program of group work and case studies of recent disasters dealing with the roles of the coroner, pathologist, casualty surgeon and voluntary organizations.

Care of People in Emergencies

Planning for care of victims including welfare, information and counselling when dealing with large numbers of people who need to be evacuated and accommodated. Seminar designed for county social services, local government emergency planners, representatives of emergency services, the National Health Service, and voluntary organizations with responsibilities in aftercare and victim support.

Civil Emergencies Adviser Seminars

Special event seminars drawing on experience of national and international experts to respond to specific developments or to support the work of the Home Office's Civil Emergencies Adviser.

Civil Military Cooperation in Emergencies

Multi-disciplinary program for armed forces officers, representatives from central and local government and relevant civilian organizations designed to cover the major areas of possible military aid to the civil community in disasters.

Crowd-Related Emergencies

Case studies for emergency preparedness for all involved in planning for crowds, including managers of major events, emergency planning officers, emergency services personnel, and members of voluntary organizations.

Counseling and Aftercare

Planning for interagency cooperation and understanding for psychosocial support after a disaster for those employed in social service departments, the National Health Service, the voluntary sector, emergency planning units, emergency services and the armed forces.

Elected Members Seminar

Local authority elected members study the roles and responsibilities of elected members and local authorities in various emergencies. Local councilors who were involved in recent disasters explain their own roles and actions taken by their authority.

Emergency Management

Senior executives from the public and private sectors consider the common elements of crisis management within the context of their wider corporate roles and compare differences in management culture between the public and private sectors.

Emergency Management for Voluntary Organizations

Providing an understanding of the integrated approach to emergency management with particular reference to coordination and cooperation and to the volunteers' relationship with the emergency services and the local authorities.

Environmental Health

Program for environmental health officers and local authority emergency planning officers to improve participants' understanding of emergency preparedness and the contribution to be made by environmental health professionals.

Hazardous Materials

Specialists cover the major areas concerned with safety of hazardous substances including risks, legal safety requirements, emergency procedures, environmental problems, and the roles and responsibilities of all associated agencies.

Inter-Agency Response to Major Disasters

Multidisciplinary composition of the seminar enables participants to identify the elements which are common to the successful management of major civil emergencies and thereby understand the importance of liaison and cooperation between all services and agencies involved in the response phase of an emergency.

Local Government Senior Management

Program to enable local authority chief executives, chief officers and other senior managers to examine the variety of problems likely to face them during and in the aftermath of a major civil emergency, and to discuss current developments in emergency preparedness.

Metropolitan Authorities

Seminar provides an opportunity for local authority chief executives, elected members and those with responsibilities for emergency response in metropolitan areas to come together with a view to improving preparedness at the local level.

Multi-Agency Nuclear Emergency Response

Overview of the inter-agency response and demonstration of the concept of integrated emergency management and the need for coordinated action in dealing with the media in a nuclear emergency for those executives with a role to play in the off-site response.

National Health Service Seminar

Principles of emergency management for relevant executive personnel of the National Health Services.

News-Media and Information

Establishing effective relationships with the news media and the successful handling of information are acknowledged to be particularly

important aspects of emergency management. This seminar brings together emergency services, local government, the utilities, industry, and voluntary organizations who have an information role in emergencies.

Operational Risk Assessment

Seminar for industrialists, emergency planners and emergency services personnel to cover company management of risk throughout the life of a site, new techniques for major incident risk assessment for on-site and off-site incidents, and applying operational risk assessment in the workplace.

Pollution Aspects of Disasters

Examination of the problems of land, water and air pollution spects of disasters for local authority and emergency services personnel.

Pop Concerts Guidance

Emergency preparedness planning for all involved in planning for pop concerts, including managers, emergency planning officers, emergency services personnel, and members of voluntary organizations.

Senior Ambulance Officers' Seminar

Principles of integrated emergency management and the roles and responsibilities of senior ambulance officers.

Senior Police Officers' Seminar

Principles of integrated emergency management and the roles and responsibilities of senior police officers.

Specialists Seminar in Emergency Planning

This seminar provides an opportunity for experienced emergency planners from central and local government, the emergency services, the utilities and industry as well as representatives from the voluntary organizations to come together to exchange views and to consider current issues in emergency preparedness.

Technical Services/National Utilities

Program designed to enable managers from the technical services of local authorities and technically-oriented organizations, including the national utilities, to consider the management of a hypothetical major emergency.

The following courses will be offered in 1994-95:

Communications Course

Comprehensive update on communications policy, systems, and equipment for emergency communications planning officers and local authorities.

Introduction to Emergency Planning

Overview of emergency planning in the United Kingdom for newly appointed emergency planners, representatives of voluntary organizations, the armed forces, emergency services, and elected members.

Management of Training and Exercise Design

Organization, management and evaluation of various emergency preparedness exercises.

Understanding Radiation

Specialists in the field provide a basic understanding of radiation for national security and nuclear incident emergency preparedness planners.

Water Course

Planning for national security and civil emergencies for water company, National Rivers Authority staff and local authority officers.

Women's Royal Voluntary Service

Emergency planning course for members of the Women's Royal Voluntary Service.

1994 Schedule of Seminars and Courses

07 Sep-28 Sep	Women's Royal Voluntary Service Seminar
28 Sep-30 Sep	Counselling and Aftercare Seminar
03 Oct-05 Oct	Hazardous Materials Seminar
06 Oct-07 Oct	Multi-Agency Nuclear Emergency Response Course
10 Oct-12 Oct	Metropolitan Authorities Seminar
12 Oct-14 Oct	Emergency Management Seminar
17 Oct-21 Oct	Communications Course
24 Oct-26 Oct	Elected Members Seminar
26 Oct-28 Oct	Emergency Planning for the National Health Service
31 Oct-04 Nov	Women's Royal Voluntary Service Seminar

14 Nov-16 Nov Civil Emergencies Advisor's Conference
16 Nov-18 Nov Health, Safety, and Welfare at Pop Concerts Seminar
21 Nov-23 Nov Emergency Services Seminar - The Inter Agency Response to Disaster
23 Nov-25 Nov News Media and Information Seminar
28 Nov-30 Nov Pollution Aspects of Disasters Seminar
30 Nov-02 Dec Crowd Related Emergencies Seminar
05 Dec-07 Dec Emergency Management Seminar
07 Dec-09 Dec Health, Safety, and Welfare at Pop Concerts Seminar
12 Dec-16 Dec Introduction to Emergency Planning

1995 Schedule of Seminars and Courses

03 Jan-05 Jan Emergency Management Seminar for Voluntary Organizations
05 Jan-06 Jan Multi-Agency Nuclear Emergency Response Course
09 Jam-11 Jan Civil Emergencies Advisor's Conference
16 Jan-18 Jan Rabies Seminar
23 Jan-25 Jan Crowd Related Emergencies Seminar
25 Jan-27 Jan National Health Service Seminar
30 Jan-01 Feb News Media and Information Seminar
06 Feb-08 Feb Metropolitan Authorities Seminar
08 Feb-10 Feb Pollution Aspects of Disaster Seminar
13 Feb-15 Feb Introduction to Risk Assessment
20 Feb-22 Feb Elected Members Seminar
22 Feb-24 Feb Emergency Planning for the National Health Service
27 Feb-01 Mar Health, Safety, and Welfare at Pop-Concerts Seminar
06 Mar-08 Mar Counselling and Aftercare Seminar
08 Mar-10 Mar Rest Centre Management Seminar
15 Mar-17 Mar Hazardous Materials Seminar
20 Mar-22 Mar Rabies Seminar
22 Mar-24 Mar Health, Safety, and Welfare at Pop Concerts Seminar
27 Mar-29 Mar Emergency Management Seminar
29 Mar-31 Mar Crowd Related Emergencies Seminar
03 Apr-05 Apr Care of People in Emergencies Seminar
10 Apr-13 Apr Understanding Radiation Course
19 Apr-21 Apr Water Course
24 Apr-25 Apr Emergency Management Seminar for Voluntary Organizations

26 Apr-28 Apr	Technical Services/National Utilities Seminar
01 May-03 May	News Media and Information Seminar
03 May-05 May	Health Service Emergency Planning Conference
10 May-12 May	Rest Centre Management Seminar
15 May-19 May	Women's Royal Voluntary Service Seminar
22 May-24 May	Emergency Management Seminar
05 Jun-07 Jun	Counseling and Aftercare Seminar
07 Jun-09 Jun	Crowd Related Emergencies Seminar
12 Jun-14Jun	Emergencies Services-Inter Agency Response to Disasters
14 Jun-16 Jun	Hazardous Materials Seminar
16 Jun-18 Jun	Institute of Civil Defense & Disaster Studies Conference
19 Jun-21 Jun	Environmental Health Seminar
21 Jun-23 Jun	Metropolitan Authorities Seminar
28 Jun-30 Jun	Management of Training and Exercise Design
05 Jul-07 Jul	Emergency Planning for the National Health Service
10 Jul-14 Jul	Introduction to Emergency Planning
17 Jul-19 Jul	Civil Emergencies Adviser's Conference
19 Jul-21 Jul	Civil Emergencies Adviser's Conference
24 Jul-26 Jul	Elected Members Seminar
26 Jul-28 Jul	Local Government Senior Management Seminar

Emergency Managers Mutual Aid in California

EMERGENCY MANAGERS MUTUAL AID IN CALIFORNIA
Russell C. Coile, Ph.D, CEM
Pacific Grove Fire Department Pacific Grove, California

Introduction

The Fire Departments and Police Departments of many cities in California have agreements for mutual aid in case of events which might overwhelm the local capabilities to cope with the event. Public Works departments are also taking action to sign similar mutual aid agreements. Prior to the Northridge earthquake in January 1994, there was no statewide system for formal mutual aid for emergency managers. The State of California now has a mutual aid system for emergency managers.

The Governor of California has an Office of Emergency Services. The Governor's Office of Emergency Services in Sacramento has three regional offices - Southern, Coastal and Inland. The emergency managers of the Coastal Region were attending a quarterly meeting in San Francisco on Friday, January 21, when Richard Eisner, Coastal Region Administrator received a telephone call from Dr. Richard Andrews, Director of the Governor's Office of Emergency Services. Dr. Andrews was the State Coordinating Officer and was at the OES/FEMA Disaster Field Office in Pasadena with the Federal Coordinating Officer and James Lee Witt, FEMA Director. Dr. Andrews asked if Rich Eisner could send some Coastal Region emergency managers to Los Angeles as soon as possible to help provide mutual aid to Southern Region managers.

Henry Renteria, City of Oakland's emergency manager, and Raelene Wong, Sunnyvale's emergency manager were asked to go to Los Angeles and establish an Emergency Managers Mutual Aid (EMMA) office. Henry, Raelene and some of the others of the advance party went to Pasadena the next day, Saturday, January 22 and set up a temporary staging office in a suite at the Pasadena Hilton Hotel, across the street from the Disaster Field Office.

I drove the 350 miles from Pacific Grove to Los Angeles on Saturday, arriving in the evening. I and the others of the initial group of nine reported

in to the EMMA staging office in the Pasadena Hilton on Sunday morning. We received our initial orientation briefing and our State OES photo identification badges, and then were issued a cellular telephone, pager, charger, spare battery, etc. That afternoon, EMMA was assigned office space on the fourth floor of the Disaster Field Office and we closed down the staging office and moved from the hotel to the DFO. Dr. Andrews came around to our new office about 7 p.m. to welcome us.

Regional Emergency Operations Center

On Monday morning, most of us received assignments to go out in the field. I paid my bill and checked out of the Pasadena Hilton Hotel and drove about 40 miles south to Los Alamitos, the location of the Southern Region's Emergency Operations Center. When I reported in I was assigned to the Planning Section, and more specifically to the Situation Unit. The Planning Section's Situation Unit had experienced difficulties in getting accurate and timely information as to what was happening during the first five days after the earthquake. Consequently, the incident commander had decided to use some of the unique capabilities of the California Department of Forestry and Fire Protection (CDF) there at the Regional Emergency Operations Center REOC) to get up to date information.

The 200 or so CDF personnel there were already providing all of the logistic support for the expanded REOC. They had established a Fire Camp, with kitchen trailers, tents, refueling sites, staging areas, the whole works. The CDF had taken over a Ramada motel about a mile away for sleeping accommodations. The CDF has a number of 'observers.' These are firefighters trained for intelligence collection who are sent out in a wild land fire, for example, to collect timely information on the accurate locations of the fire, the local weather, the local terrain, condition of the roads or trails, if any, and all the other pertinent facts so that the Planning Section can generate the best feasible plan for all operations during the next period.

It was decided to establish 13 two-person observer teams to visit the 13 different areas in the Los Angeles with severe earthquake damage to gather information each day to help the Planning Section prepare its plan that night for the following day's operations. I was assigned to a different observer team each day for the next four days. I sent a report of my activities each day to the Emergency Manager Mutual Aid office at the Disaster Field Office each day. Extracts from my log for a typical day, 28 January (11 days after the quake) are as follows:

0700 Attended daily morning briefing at Regional Emergency Operations Center, Los Alamitos, Assigned to CDF Observer team #1. Faxed Coile memo 'Errors in January 24,1994 Summary Report of DAC Managers' Report' to EMMA office at DFO, Pasadena.

0815 Departed Los Alamitos 0945 Arrived Disaster Application Center #1, Northridge (50 miles). Met DAC manager and obtained a copy of DAC #1 Manager's Report.

1205 Visited Salvation Army Tent Shelter, Lanark Park and Mobile DAC #4.

1315 Visited Red Cross Service Center, Epiphany Luthern Church, 58 Canoga Park.

1340 Visited Salvation Army Tent Shelter, Canoga Park.

1600 Observer team noticed damaged trailers while driving by trailer park. Stopped to investigate. President of Homeowners Association reported that they had conducted their own preliminary damage assessment and found that 136 of 190 trailers had been knocked off foundation supports. They had turned the gas off so that there were no fires. (Two other nearby trailer parks had numerous fires.) Homeowners had pooled food, organized communal cooking, and had bought water. They expressed a need for six porta-potties for some elderly folks who had trouble walking to their neighbors' trailers.

1830 Arrived back at Regional EOC in time for debriefing of observer teams (1800-1900).

1900 Attended night briefing at REOC.

I felt that my assignment had been an educational one for me. I was glad that I was able to provide a small amount of assistance with the collection of statistical data.

Emergency Managers Mutual Aid

The manager of the first Emergency Managers Mutual Aid group, Henry Renteria, prepared this mission statement and objectives for us:

Mission Statement

To provide professional Emergency Management services at the request of State Office of Emergency Services in the form of Mutual Aid to the impacted area and support Disaster Operations and Recovery.

Objectives

Provide Emergency Managers to work in Disaster Application Center management positions

Provide Emergency Managers to support Disaster Field Office operations

Provide Emergency Managers to support local Emergency Operations Center operations

Coordinate reception, assignment, and training of assigned personnel

Manage Emergency Managers Mutual Aid

Develop Emergency Managers Mutual Aid Procedures

A total of 107 emergency managers were eventually assigned to assist the OES Southern Region's managers, usually on 7 day assignments. The mutual aid managers were given a variety of assignments, and the overall evaluation was that these assignments had been worthwhile and cost-effective. The Regional EOC has several other ways to augment its core staff during disasters, including bringing back reservists and arranging for temporary hires.

Steps have already been taken by the Governor's Office of Emergency Services to formalize this mutual aid system for emergency management (see below). The details of mutual aid are spelled out, such as the provision that each individual's salary and benefits continued to be paid by his or her local government while disaster assignment expenses such as travel, per diem, and overtime beyond 40 hours per week will be reimbursed by the emergency activity to which the person is temporarily assigned.

Assistance Agreement for all Federal Fiscal Year 1994 Emergency Management Assistance Program Applicants

(Letter dated March 9,1994, State of California, Office of Emergency Services, 2800 Meadowview Road, Sacramento, California 95832)

Article VIII Emergency Use of Resources

A. In accordance with the objectives of this Agreement, and in order to enhance state and local emergency management, including emergency response capability, any personnel, supplies, equipment, and facilities funded in whole or in part within this Agreement may be employed in emergency operations in connection with natural or technological disasters, without change in funding among programs, subject the following conditions:

1. Such use shall not detract from, nor be allowed to prevent, accomplishment of the objectives set forth in the statement of work for the program activity under which these resources are funded.

2. The primary use of any resources funded under this Agreement shall be to accomplish the objectives of the program activity under which it is funded.

3. The temporary reassignment of personnel otherwise authorized by this Agreement must be justifiable because of an urgent need for staff or due to the occurrence of a natural disaster as defined in Section 3 (Definitions) of the Federal Civil Defense Act of 1950, as amended.

4. Expenses above the ordinary salary or normal program expense to support the resource (e.g. travel, per diem, etc.) must be paid by the emergency activity to which the resource is temporarily assigned.

5. No individual shall be hired or other resource acquired under this Agreement for the sole or principal purpose of use in this emergency or disaster.

6. Personnel supported under the Act in whole or in part through contributions may be assigned to emergency response operations for up to 30 consecutive days at the discretion of state officials, with extensions to longer periods upon request.

a. The FEMA Regional Director may grant an extension up to 90 consecutive days.

b. The FEMA Associate Director for State and Local Programs and Support may grant an extension of longer than 90 days (to the end of the fiscal year).

c. Disaster response work during such an extension period should be documented by amendment to the CCA as contributing to the comprehensive emergency management state of preparedness.

d. For programs whose personnel are supported in whole under the Act, when work or objectives are altered due to such extension, the FEMA and State Signatory officials may decrease the scope of work by amendment to the CCA.

7. An accounting audit trail must be maintained for any such use of resources.

8. In the event the recipient fails to comply with paragraphs 1 through 7, the FEMA Regional Director shall have the right to require that use of

those resources be compensated by non-FEMA sources or to disallow such use of funds.

B. Personnel funded through the Comprehensive Cooperative Agreement (CCA) may be used as part of interstate support in disaster operations.

1. The Federal Emergency Management Agency (FEMA) endorses the concept that state and local emergency management personnel funded through programs included in the State's Comprehensive Cooperative Agreement (CCA) may work in disaster operations for up to 30 consecutive days in another state where a Presidential Disaster Declaration has been issued.

2. This support may be initiated when the affected state requests disaster operations help and the donor state offers support in accordance with pre-arranged agreements. Work assignments for donor state personnel should contribute to their home state's expertise to contend with a large-scale disaster of its own.

3. Salaries and benefits paid in whole or in part will continue to be paid through the CCA, with per diem, overtime, transportation, and other extraordinary expenses to be paid through the recipient state's administrative allowance for the Public Assistance and/or Individual and Family Grant programs.

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Pacific Grove Fire Department

Mr. Coile has been the Disaster Coordinator for Pacific Grove Fire Department, Pacific Grove, California since 1990. Earlier he was involved with research experience on earthquakes, training exercises, chemical and nuclear preparedness, design of emergency operations centers, and radio propagation in the ionosphere. He is a Colonel, USAF (Ret).; Registered Professional Engineer: District of Columbia and Pennsylvania. Education: S.B., S.M., E.E., Ph.D

Disaster Preparedness Activities In California After The 1989 Loma Prieta Earthquake

DISASTER PREPAREDNESS ACTIVITIES IN CALIFORNIA AFTER THE 1989 LOMA PRIETA EARTHQUAKE

By Russell C. Coile, Ph.D, CEM
Disaster Coordinator, Pacific Grove Fire Department
Pacific Grove, CA

ABSTRACT

The American Red Cross received donations from all over the United States for the victims of the October 17, 1989 Loma Prieta earthquake. After assisting earthquake victims with their immediate needs, the American Red Cross set up the Northern California Earthquake Relief and Preparedness Project to administer a special fund of these donor-designated contributions for further earthquake preparedness measures and to strengthen response capabilities of American Red Cross chapters in northern California.

After the initial distribution of relief assistance, the American Red Cross and the United Way of the San Francisco Bay Area then jointly established the Northern California Disaster Preparedness Network to use some of the remaining American Red Cross funds to implement a five-year plan called the Greater Bay Area Vision for Disaster Preparedness which had been developed by the United Way.

Three committees were established to award disaster preparedness grants to community-based organizations in northern California counties. These were the San Francisco Bay Area, Santa Clara County, and the Tri-County (Monterey, San Benito, and Santa Cruz counties) Community Disaster Preparedness Committees.

There were 47 grants awarded during the first three years of this five-year program. Some typical grants were: translate community response team training materials into Cantonese, Tagalong, and Spanish; outfit earthquake and fire safety training trailer scaled to the size of a six-year old child for teaching school children earthquake preparedness; develop culturally relevant materials and dissemination methods to train low income Spanish-speaking families in disaster preparedness; and adapt training in

disaster preparedness and first aid for the visually impaired and distribute materials in cassette, large print, and Braille.

Introduction

The American Red Cross received 74 million dollars in designated donations to help earthquake victims in northern California after the 1989 Loma Prieta earthquake. As it turned out, these funds were more than enough for the immediate disaster relief efforts. Therefore, it was determined that any money left over should remain in northern California and be used for earthquake preparedness activities.

Northern California Earthquake Preparedness Project

Initially, two million dollars were used to establish a two-year American Red Cross unit called Northern California Earthquake Preparedness Project to build greater American Red Cross earthquake response capacity throughout the region. This was the first fully funded risk area-specific Red Cross unit created to evaluate current levels of preparedness and to invest in planning, preparedness and education. This two year project prepared risk analyses of natural disasters, developed a disaster response plan for American Red Cross units in northern California, and assembled an extensive resource directory of American Red Cross human and material disaster response resources.

Northern California Disaster Preparedness Network

However, it became evident that the American Red Cross alone cannot provide all the services a community would need after a large disaster. It was then decided that the Red Cross should take the lead in organizing the coordination and cooperation of other community-based organizations and businesses to assist local governments in coping with preparedness activities for a big disaster, perhaps of the magnitude of the 1906 San Francisco earthquake. The United Way of the San Francisco Bay Area had independently studied these large-scale disaster response problems. United Way had held a series of town meetings with 600 participants and engaged a consulting firm to develop a vision of community education for disaster preparedness. From thousands of comments and multiple needs identified by the participants, six themes were distilled: prevention and self sufficiency; coordinated response; assessing needs; raising and deploying resources; learning from experience; sustaining and improving preparedness.

The American Red Cross and the United Way therefore jointly decided in 1992 that the American Red Cross would provide funding of five million dollars for a new five-year project called the Northern California Disaster Preparedness Network to implement this vision of community education.

Community Disaster Preparedness Committees

The Northern California Disaster Preparedness Network established Community Disaster Preparedness Committees in San Francisco, Santa Clara County, and the tri-county area of San Benito, Santa Cruz and Monterey counties. The mission of these committees was basically to review applications for grants from local organizations and to recommend distribution of funds (approximately a million dollars each year). Examples of the types of projects which have been supported are shown below.

Santa Clara County Disaster Preparedness Committee

Each committee began its work by preparing a risk analysis study of its area to determine if there were unique problems or considerations which should be taken into account for preparedness for a large scale earthquake. For example, the Santa Clara County Committee is responsible for a total population of 1,455,828. The county includes the cities of San Jose (population 782,248), Sunnyvale, Santa Clara, Palo Alto, Milpitas, and Mountain View. Twenty-one percent of the total county population is Mexican with 2.4 percent speaking only Spanish. In three areas, over 40 percent of the population is of Mexican ancestry: East Foothills (41.8 percent), Gilroy (self-proclaimed 'Garlic Capitol of the World' 47.3 percent), and San Martin (55.6 percent). Other populations at risk are Asian and Pacific Islander residents, especially for 3.7 percent of the population who speak only their native language.

Based on its analysis, the Committee identified three local special programs for future assistance:

Multicultural programs: target isolated populations who have not received earthquake preparedness education, and provide instruction in first aid and earthquake preparedness in appropriate languages.

Communications: provide communications in multiple languages, and encourage communications planning among local governments, schools, businesses, and non-profit organizations for the diverse populations.

Collaboration/Resources: Develop a service plan for coordinating resource delivery to the various diverse populations of the community.

The initial projects of the Santa Clara Committee listed in the Appendix illustrate the emphasis placed on these three themes.

Tri-County Disaster Preparedness Committee

The Tri-County Committee found a dozen gaps in disaster preparedness in Monterey, San Benito and Santa Cruz counties: lack of adequate planning for sufficient emergency shelters; lack of disaster personnel to run shelters and provide assistance (numbers, training, and multi-lingual/multi-cultural skills); lack of planning for temporary homes (foundations and utilities for FEMA-supplied mobile homes); no coordination of organizations (Red Cross, Salvation Army, National Guard, schools, and churches); no training, no exercising and no participation in the State of California's annual earthquake exercise; offers of assistance from amateur radio operators to provide emergency communications had sometimes been rejected; lack of neighborhood self-help response groups; gaps in planning for disabled and elderly populations; no planning for utilization of convergent volunteers; no planning for pet shelters with food and veterinarians (Red Cross will not allow earthquake victims to bring their pets with them into shelters); no planning for donations (requirements, receipt, inspection, sorting, cleaning, repair, storage, transport, and distribution); lack of mutual aid agreements for cooperation and coordination.

The criteria for prioritization of projects to address these gaps in disaster preparedness given to the organizations who were preparing applications for grants included three aspects: cost effectiveness, transferability, and coordination of organizations. For cost effectiveness, projects were reviewed to determine if they provided maximum impact with minimum funding, and if they used human and material resources in a cost-effective manner. For transferability, projects were reviewed to see if they had a broad impact and could be transferred for use by other groups inside and outside the Tri-County area. For the coordination issue, projects were reviewed to see if they had appropriate operational interfaces with local government and other groups, if they benefited populations at special risks, and if they provided knowledge of preparedness back to the community.

Disaster Preparedness Symposium

On October 17, 1994, the fifth anniversary of the Loma Prieta earthquake the Northern California Disaster Preparedness Network presented a disaster symposium and recognition event — Beyond Loma Prieta: Pioneering

Preparedness — at Millbrae, California. An exhibit of disaster preparedness materials and services developed by the 133 organizations supported by the Network had been prepared for the participants. The symposium's program included a keynote address 'The Lessons of Loma Prieta' by Sylvia Panetta and a variety of workshops: Preparing for special needs of elderly, disabled, and lower income populations; FEMA, Red Cross, California Emergency Services: Heeding the lessons of Loma Prieta; Coordinating Community-based disaster services; Coordinating disaster health & mental health services; Strategies for serving non-English speaking individuals and immigrants; Business pioneers disaster preparedness; Preparing for special urban needs; Resources for preparedness (grants information workshop); Our preparedness report card: Priorities, gaps, recommendations; Moving on toward our vision for disaster preparedness.

Conclusion

The American Red Cross and United Way established a five-year program in 1992 to implement a vision of community outreach and education for disaster preparedness in northern California. The basic approach was a grass-roots effort to get local people and local organizations to examine problems which had been encountered in the Loma Prieta earthquake. After gaps in disaster preparedness had been identified, local organizations were encouraged to submit applications for grants to address these problems. This paper is a progress report on the grants awarded by the three committees.

APPENDIX: Initial Grants Awarded By Community Disaster Preparedness Committees

American Red Cross (Bay Area): Survey community based organizations and develop a plan for comprehensive community preparedness. Develop partnerships.

University of San Francisco: Conduct two seminars to promote collaboration among community based organizations and local governments, Design an emergency management curriculum.

The Volunteerism Project: Prepare Volunteer Centers to survive an earthquake, and collaboratively manage emergent volunteers in a five county area.

St. Vincent de Paul Society: Organize social service auxiliary of San Francisco Archdiocese (San Francisco, San Mateo, and Marin counties) for

disaster relief.

City of Oakland: Translate community response team training materials into Cantonese, Tagalog, and Spanish.

City of Pleasanton: Prepare for disaster-caused needs of special education students, especially transportation.

Berkeley-Oakland Support Services: Organize county wide coalition of community-based organizations to prepare for disaster response and relief, and integrate into the Standardized Emergency Response System plan.

Santa Cruz Westside Community Health Center: Purchase equipment and supplies needed to qualify as a designated disaster response clinic during a declared disaster.

Oakland Fire Department: Provide search and rescue training for teams of public and private sector people selected for their level of special skills and commitment to respond regionally and nationally.

Marin County Volunteer Center: Purchase emergency power and communications equipment as part of a countywide plan to manage volunteer resources in disasters.

Marin Fire Prevention Officers: Outfit fire and life safety training trailer for use at schools and fairs, staffed by trained volunteers.

Nicasio Disaster Council: Train, equip, and provide coordination for neighborhood emergency response teams. Provide model of training and outreach to Marin County.

Fire Safe Marin: Augment countywide fire safety awareness and· outreach program as a coalition of public, private, and community agencies.

San Francisco Chinese Health Coalition: Educate and recruit volunteers for preparedness activities. Conduct disaster response drill.

San Francisco Fire Department: Train Chinese and Spanish-speaking neighborhood emergency response teams, using culturally relevant adaptations of the Neighborhood Emergency Response Team training program.

San Francisco Food Bank: Plan to provide post-disaster food distribution to low income areas through pre-designated and prepared sites.

San Francisco Chinese Health Coalition/The Salvation Army: Adapt and deliver personal and neighborhood preparedness programs to homebound populations in Chinatown.

Santa Clara County Community Agency Disaster Relief Effort: Develop and maintain the capacity of the county's nonprofit agencies to respond

to disaster resource and service needs in conjunction with government, business, and other response agencies.

Alviso Family Health Foundation: Develop culturally relevant materials and dissemination methods to train low-income Spanish-speaking families in disaster preparedness and first aid. Increase collaboration between the Mexican community and the American Red Cross.

Alum Rock Union Elementary School District: Provide students and parents with disaster preparedness and First Aid skills in English and Spanish.

Santa Clara County Emergency Managers Association: Translate earthquake education materials into Asian languages, and develop multi-lingual educational tools for media dissemination.

Peninsula Center for the Blind and Visually Impaired: Adapt training in disaster preparedness and first aid for visually impaired people. Distribute materials in cassette, large print, and Braille.

San Benito Health Foundation: Conduct preparedness outreach and education for low-income rural isolated populations.

Monterey County Area Agency on Aging: Create an emergency 'Just-in-Case' three day food package for Meals on Wheels recipients for disaster periods such as earthquakes when transportation of daily meals may be impossible.

San Benito County Salud Para la Gente: Train community-based clinics in effective strategies for immediate disaster response and develop plans to maintain primary health care services during disasters.

American Red Cross (Santa Cruz County Chapter): Adapt the In-kind Donations System developed by the American Red Cross to the needs of Tri-County organizations. Develop a community-based coalition to solicit in-kind donations and manage their flow during disaster response operations.

Second Harvest Food Bank of Santa Cruz & San Benito Counties: Complete Food Bank disaster response plan for maintaining operations and service in the event of community-wide disasters.

Pacific Grove Fire Department: Purchase and equip an earthquake preparedness and fire safety trailer (two story house built to the scale of the size of a six-year old child) for use at schools throughout Monterey, Santa Cruz and San Benito Counties.

San Benito County Community Pantry: Complete, implement, and test

the Community Pantry disaster plan to assure distribution of food during a disaster. Develop outreach and training materials in Spanish.

Davenport Fire Department: Purchase an emergency power generator and develop an evacuation center for this isolated coastal region.

City of Watsonville: Create training materials and distribute the Watsonville community disaster plan to Spanish-speaking rural areas of Hollister, San Juan Batista, Salinas, Gonzales, Soledad and King City in Monterey and San Benito counties.

San Lorenzo Valley Disaster Planning Committee: Prepare an outreach disaster calendar using art prepared by school children to increase community awareness of disaster preparedness for 28 organizations in this isolated valley near the epicenter of the 1989 Loma Prieta earthquake

The Role Of Amateur Radio in Providing Emergency Electronic Communications

THE ROLE OF AMATEUR RADIO IN PROVIDING EMERGENCY ELECTRONIC COMMUNICATION FOR DISASTER MANAGEMENT

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ABSTRACT

In the United States, the Federal Emergency Management Agency (FEMA) provides support to State and local governments in fulfilment of their responsibilities for preparedness, response, recovery and mitigation of disasters. One method FEMA has used to support State and local emergency communication functions was to sign and implement a Memorandum of Understanding with the American Radio Relay League (ARRL) for amateur radio operators to provide electronic communications for State and local governments in disasters.

The Federal Communications Commission (FCC) has licensed more than 600,000 amateur radio operators in the United States. The national organization of amateur radio operators called the American Radio Relay League (ARRL) was formed in 1914. More than 80,000 of these amateurs have registered their availability for emergency communications in disasters in the ARRL's Amateur Radio Emergency Service (ARES).

Amateur radio operators have been providing communications in natural disasters such as floods, hurricanes and earthquakes since 1913. Since amateur radio operation in the United States was prohibited during the years of both World Wars I and II, FEMA has sponsored a new branch of the amateur service called Radio Amateur Civil Emergency Service (RACES). RACES operators are authorized to operate if the President invokes his War Emergency Powers while all other amateur operation would be silenced.

Some amateur radio operators in the United States communicate by sending Morse code signals, others prefer to use microphones. Some use computer-to-computer communications, while still others set up amateur television stations

so that they can see the person they are talking to. The role of amateur radio in providing emergency electronic communications for disaster management will be examined and future contributions will be explored.

Introduction

American Radio Relay League (ARRL)

The national organization of amateur radio operators, the American Radio Relay League (ARRL) was formed in 1914. Individuals and clubs have been involved in providing communications during disasters from the earliest days of amateur radio. Radio amateurs at the University of Michigan and Ohio State in 1913 provided emergency communications for a Midwest area isolated by a severe windstorm. In 1935, the ARRL reorganized and formalized this type of activity by establishing its 'Amateur Radio Emergency Service' and appointing amateurs all over the United States to be Emergency Coordinators. In 1949, the ARRL created its 'National Traffic System.' The ARRL's monthly magazine is called 'QST,' (Ford, 1994). The Federal Emergency Management Agency (FEMA) and the American Radio Relay League signed a Memorandum of Understanding on August 3, 1984. (Note: A copy of ARRL MOU can be obtained from Richard Palm, Manager, ARRL Field Services,e-mail: rpalm@arrl.org). According to this memorandum: 'The purpose of this document is to state the terms of a mutual agreement between the Federal Emergency Management Agency (FEMA) and the American Radio Relay League (ARRL), that will serve as a framework within which volunteer personnel of the ARRL may coordinate their services, facilities, and equipment with FEMA in support of nationwide State and local emergency communications functions. It is intended, through joint coordination and exercise of the resources of ARRL, FEMA, and Federal, State and local governments, to enhance the nationwide posture of emergency communications readiness for any conceivable emergency.'

Federal Communications Commission (FCC)

The Federal Communications Commission has rules and regulations for the amateur radio service in Part 97 of its Rules. The role of amateur radio in emergencies is stated in Rule 97.1 Subpart A General Provisions:

97.1 Basis and purpose. The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.

Radio Amateur Civil Emergency Service (Races)

During the cold war era, civil defense planners in the Defense Department requested the Federal Communications Commission to establish a 'Radio Amateur Civil Emergency Service' so that there could be special amateur radio communications during a war when normal amateur communications would be prohibited as happened throughout the war years of World Wars I and II, (FEMA, 1991).

FCC Rule 97.3 Definitions defines RACES as follows:

7.3 (a) (33) RACES (radio amateur civil emergency service). A radio service using amateur stations for civil defense communications during periods of local, regional or national civil emergencies.

Amateur Radio Support Of The Federal Response Plan

The Federal Response Plan (1992) has twelve emergency support functions with primary agencies as shown for Emergency Support Functions (ESF)

ESF	Functional Area	Primary Agency
1	Transportation	Department of Transportation
2	Communications	National Communication System
3	Public Works	Army Corps of Engineers
4	Firefighting	Dept. of Agriculture/Forest Service
5	Information/Plans	FEMA
6	Mass Care	American Red Cross
7	Resource Support	General Services Administration
8	Health & Medical	Dept. of Health/Public Health Service
9	Search & Rescue	Department of Defense
10	Hazardous Materials	Environmental Protection Agency
11	Food	Department of Agriculture
12	Energy	Department of Energy

Emergency Support Function #2: Communications And Amateur Radio

Amateur radio is included in Emergency Support Function #2 Communications. The primary agency for ESF #2 is the National Communications System. The National Communications System signed a Memorandum of Understanding with the American Radio Relay League on June 2, 1983.

The purpose of this communications function as stated in ESF#2 I. Introduction A. Purpose is: 'The purpose of this Emergency Support Function (ESF) is to assure the provision of Federal telecommunications support to Federal, State, and local response efforts following a Presidentially declared emergency, major disaster, extraordinary situation and other emergencies under the Federal Response Plan. This ESF supplements the provisions of the National Plan for Telecommunications Support in Non-Wartime Emergencies, Hereafter referred to as the National Telecommunications Support Plan (NTSP).'

ESF#2 VI. Resource Requirements B. Support for Field Activities states:

'Amateur Radio networks /systems may provide daily and emergency public service communications during emergencies and major disasters. The American Radio Relay League (ARRL) sponsors the combined facilities of the Amateur Radio Emergency Services (ARES) and the National Traffic System (NTS), and recognizes the Radio Amateur Civil Emergency Services (RACES) and the Military Affiliate Radio System (MARS). Other licensed amateur activities and Personal Service Radio (PSR) groups also provide public communications during emergencies and major disasters.Members of the Radio Emergency Associated Communication Team (REACT) perform similar services utilizing Citizen Band radio equipment.'

Emergency support function #6 mass care and amateur radio

Amateur radio provides communications support to the American Red Cross, the primary agency for Emergency Support Function #6 Mass Care. The American Radio Relay League and the American Red Cross have had cooperative statements of understanding since 1940. The current Statement of Understanding is dated July 13, 1982.

The purpose of this function as stated in ESF #6 I. Introduction A. Purpose is:

'The purpose of this Emergency Support Function (ESF) is to coordinate efforts to provide sheltering, feeding, and emergency first aid following a catastrophic earthquake, significant natural disaster or other event requiring Federal response assistance; to operate a Disaster Welfare Information (DWI) System to collect, receive, and report information about the status of victims and assist with family reunification within the disaster area; and to coordinate bulk distribution of emergency relief supplies to disaster victims following a disaster.'

Amateur radio operators help with communications among American Red Cross shelters and also assist with communications for the disaster welfare information system. The disaster welfare information is discussed in ESF#6 II. C. DWI System:

'1. DWI, consisting of those persons identified on shelter lists, National Disaster Medical System (NDMS) casualty lists, and any further information made available by the State Emergency Operations Centers (EOCs) and hospitals will be collected and made available to immediate family members within or outside the affected area.'

'7. Communications support agencies identified in ESF #2 - Communications will be tasked with transmitting information to the DWI Center. In no case will fatality lists be transmitted via amateur radio or the ARC 47.42 Mhz system'

Some of ESF #6's planning assumptions which are relevant to communications support by amateur radio are stated in ESF#6 III. Situation B. Planning Assumptions:

'1. ESF#6 planning is based on a worst case scenario in which a disaster occurs without warning at a time of day that will produce maximum casualties, but also considers other disaster which could cause large numbers of casualties and result in widespread damage necessitating the temporary relocation of disaster victims.'

'4. A formal ESF#6 organizational structure for supporting the efforts of other voluntary agencies and government agencies to provide feeding, shelter, emergency first aid stations, bulk distribution centers, and providing for DWI will be in place in the disaster area within 48 hours after implementation of the Plan.'

'6. The DWI system should be capable of responding to one million disaster welfare inquiries, from around the world, within 30 days of the disaster's onset. These inquiries will relate to persons who are residents of the disaster-affected area, as well as transients such as foreign and domestic tourists, business travelers, students, etc. In addition, the system must provide information needed to reunite family members separated at the time of the disaster.'

'7. Surviving telephone service into and within the disaster area will be either inadequate or prioritized to emergency uses to the extent that it will be unable to handle disaster welfare inquiries.'

'10. The massive relocation of disaster victims will limit or prevent routine mail delivery.'

'14. The restoration of communication systems, disrupted by danages and overloads, may take weeks.'

Amateur Radio Support of The Salvation Army

The Salvation Army has for many years provided emergency services to individuals and groups in time of disaster. The U.S. Congress officially recognized the capabilities of the Salvation Army when it enacted the Disaster Relief Act of 1970, amended by the Disaster Relief Act of 1974, Public Law 93-288. The American Radio Relay League and the Salvation Army have signed a Statement of Understanding with respect to Disaster Services.

Amateur Radio Support Of The National Weather Service

The American Radio Relay League signed a Memorandum of Understanding with the National Weather Service (NWS) on January 19, 1988. Radio amateurs provide emergency communications support to the National Weather Service on an as-needed basis in weather emergencies such as hurricanes, snow and heavy rain storms, and other severe weather situations, (Hensley, 1990). The National Weather Service has a special tornado spotter service called SKYWARN. The NWS recruits volunteers, trains them in proper weather spotting procedures, and accepts the volunteers' reports during tornado watches and episodes of severe weather. Radio amateurs have assisted the NWS as communicators and spotters since the inception of the SKYWARN program, (Barton, 1991).

Disaster Management In The United States

In order to examine the role of amateur radio in providing electronic communication for disaster management, we must first look at the way Federal, State and local government authorities handle disasters. The former civil defense organization in Washington is now called the Federal Emergency Management Agency. James Lee Witt, the emergency management director for the state of Arkansas when Clinton was governor, was appointed by President Clinton to be director of FEMA in mid 1993. In October 1993, Mr. Witt reorganized FEMA to de-emphasize civil defense and to give more emphasis to preparedness for the threats of natural disasters, such as hurricanes, floods, earthquakes, tornadoes, etc. The new FEMA has four directorates: mitigation; preparedness, training, and exercises; response and recovery; and operations support.

FEMA's budget provides for assistance to each state for emergency preparedness. For example, the State of California takes one third of its grant to help support the Governor's Office of Emergency Services, and divides up the other two thirds of the grant among the counties and cities which wish to participate in this Federal program. Each county or city must provide funds to match the FEMA grant which provides funding for half of the salary expenses of emergency management personnel.

Role Of Amateur Radio In Disasters

The United States seems to have suffered an unusually large number of different types of disasters in the past few years. Hurricane Hugo in South Carolina in 1989, the Loma Prieta, California earthquake of 1989, the wildland-urban Oakland/Berkeley fire of 1991, Hurricane Andrew in Florida in 1992, the Mississippi and Missouri River floods of 1993, the Southern California fires of 1993, and the Northridge, Los Angeles earthquake of January 1994 have all been catastrophic disasters. In order to examine the role of amateur radio in support of disaster management, we will briefly review some of these large scale disasters.

Loma Prieta Earthquake, Santa Cruz, California, October 17, 1989

In the Loma Prieta (Santa Cruz) earthquake, there were 63 people killed and 3,757 injured. 1,018 homes were destroyed and 23,408 damaged while 3,530 businesses were damaged. Property damaged was estimated about $5.9 billion.

The principal cities in Santa Cruz County are Santa Cruz and Watsonville. The quake's epicenter was only eight mile from Santa Cruz. Landslides, damaged roads and bridges closed most highways and rural roads. The county was isolated with no electric power and no telephone service. 592 homes and 668 mobile homes had been destroyed, 2,069 had suffered heavy damage and 10,000 people were displaced from their homes. (Two months later, 3,000 remained homeless.)

Santa Cruz ARES members were quick to provide emergency communications. QST, March 1990, printed some first-person accounts of ham activities which provided a vivid picture of the events of October 17, (Ewald, 1990). Radio amateurs provided the initial communications between the county Emergency Operations Center (EOC) and hospitals, Red Cross shelters, and the State Office of Emergency Services in Sacramento. The Watsonville Community Hospital had been severely damaged after being displaced about a foot, which broke many pipes. The emergency power generator had been damaged and there was no telephone service. Critical-care patients had to be evacuated from the third and fourth floors of the building. Hams assisted in communicating requests for ambulances to move patients to the other two county hospitals and to hospitals in Monterey County. Medical helicopters from Stanford Medical Center and from Fort Ord. were unable to establish radio communication with the hospitals for landing clearance. Radio amateurs relayed landing instructions to the helicopters through their home bases. An amateur brought a portable generator to power lights for emergency surgery.

Amateur radio operators were able to help by reporting many gas leaks as well as broken sewer and water lines. Amateur Radio was also used to assist in coordinating arrival of structural engineers brought from other parts of California. Amateur radio was used to provide communications for about a dozen Red Cross emergency shelters for a week. Many of these locations required 24-hour coverage, and some needed two operators. About 370 amateur radio operators were involved in providing emergency communications after this earthquake.

Oakland/Berkeley Fire, October 20-23, 1991

In the Oakland/Berkeley East Bay Hills fire there were 25 people killed and 150 injured. There were 3,471 houses destroyed, and 1,600 acres burned, despite the efforts of 350 fire engines. This was the largest single urban fire disaster in the history of the United States. It was 100 times

bigger than the great Chicago fire of 1871. This fire illustrates some of the problems which resulted from poor land-use policies.

Some of the problems of the Oakland/Berkeley fire were: the fire ignited 790 homes in first hour; there was a hilly urban/wild land interface; there was no time to prepare for an orderly evacuation; narrow streets and abandoned automobiles made it difficult for fire engines to get to areas and for the police cars to evacuate residents; the Fire and Police Departments did not use the Incident Command System and had not practiced using the Mutual Aid System; there were equipment and organizational problems with communications; there were problems with low water pressure and non-standard hydrants; wood shake roofs were not treated with fire retardant chemicals; and the fire spread to adjacent houses because of lack of proper weed and brush abatement policies.

QST had an article, 'Hams Put to Test in Huge Oakland Fire - Amateur Radio played a key role in the fight against the worst fire in US history' in the February 1992 issue, (Girard, 1992). The article reported that Hams began to gather on UHF and VHF nets almost immediately after the fire started and people saw the smoke. Many of those on the nets were RACES- and ARES-trained volunteers. However, the fire was so overwhelming that in the resulting confusion it was more than five hours before amateur radio emergency volunteers were called to action in Alameda County to assist in providing communications with the Oakland Fire Department.

The Oakland Fire Department had only four channel radios which caused difficulties in communicating with the 350 fire engines brought to Oakland for mutual aid assignments. The California Department of Forestry and Fire Prevention (CDF) mobilized 70 amateur radio operators who had been trained in a CDF program called 'Volunteer in Prevention.' These hams are communication 'shadows' for CDF fire officers, (Rich, 1991). The State Office of Emergency Services' Regional Emergency Operations Center had amateur radio operators assisting in its radio room. The hams provided communications for support of the Red Cross shelters in Oakland around the clock for a week.

Participating organizations and ham clubs included: Livermore RACES, East Bay ARES, East Bay Amateur Radio Club, South Bay Amateur Radio Club, Marin County Amateur Radio Club, North Bay Amateur Radio Club, Mount Diablo Amateur Radio Club, Reno Amateur Radio Club, River City

Amateur Radio Club, N6ICW Telephone Pioneer Radio Club, and Contra Costa Repeaters.

Hurricane Andrew, Homestead, Florida, August 22, 1992

Hurricane Andrew was a catastrophic American disaster. The local and State emergency response forces were overwhelmed. Forty people were killed and 130,000 homes damaged. More than 250,000 people were left homeless. There were 630,000 people evacuated. Four million people were without electricity and water. There were 117,000 telephones out of commission. Some of the problems in Hurricane Andrew were: command & control confusion; inadequate damage assessment; 30,000 Military arrived late; too much unexpected mutual aid; unexpected donations caused problems; lack of emergency power generators; lack of emergency water and food; fire engines could not operated in winds greater than 70 mph; no wind measurements; and the National Hurricane Center radar, computer, & satellite communications failed during storm.

QST had an article describing Hurricane Andrew amateur radio operations in Florida in its December 1992 issue, (Kandel, 1992). RACES hams had been mobilized before the hurricane and were on station inside the Dade County Emergency Operations Center, a 1950 nuclear vault-like shelter. The shelter building survived the hurricane, but six of seven antennas and towers did not. VHF antennas which the County, the Red Cross and the School Board were supposed to have installed long ago on schools earmarked for shelters had not been installed. Luckily, one amateur radio repeater in Miami, 35 miles out of the severely damage area, had survived.

About 150 amateurs came from all over Florida to help in Dade County. Hams kept the EOC in constant contact with the State of Florida EOC in Tallahassee, 500 miles away. One amateur radio operator was struck by lightning and killed as he was providing communications for a helicopter unloading food supplies. Another ham in a shelter reported by radio that the hurricane wind had increased and that the roof of the gymnasium was lifting five feet off the building during gusts. He helped evacuate the shelterees to lower floors after breaking open some locked doors. The roof eventually blew off. This was the worst hurricane to hit this part of South Florida in 27 years. Amateur radio operators supported more than 80 city, county, state, and federal agencies for nine days.

Northridge, California Earthquake, January 17, 1994

The most expensive disaster in the United States was the earthquake in the Los Angeles area in January 1994. In the Northridge (Los Angeles) earthquake, there were 57 people killed, 1,566 hospitalized, and 9,158 injured. There were more than 2000 houses destroyed, 32,000 apartment units damaged, and more than 6,000 mobile homes damaged. Property damage was estimated to be about $20 Billion.

The damage was inflicted over a wide area in Los Angeles and Ventura counties. It was fortunate that so few people were killed considering that so many people were injured and so many apartments, houses, and mobile homes were damaged. The American Red Cross quickly established about 40 shelters to house the earthquake victims. However, initially only about 5,000 people registered to stay at the Red Cross shelters which were mostly school buildings, while over 20,000 others, mostly Mexican, were sleeping in public parks in makeshift tents.

The damage to the Los Angeles freeway system caused tremendous problems. It was estimated that more than 300,000 cars a day used the Santa Monica freeway before the earthquake. Since Californians in the Los Angeles area do not have mass transit yet, their automobiles and freeways are unbelievably important to them. The mutual aid system brought many firefighters and police to help respond to the quake. Specialized Federal urban search & rescue teams were flown to Los Angeles to help rescue people trapped by collapse of buildings and parking garages. Federal emergency medical teams with portable hospitals arrived, since a number of hospitals in the area not only could not provide medical attention for the thousands of injured residents, but also had to have their own patients evacuated elsewhere because of damage to their buildings.

A report in QST gave some personal accounts of ham heroics following the Los Angeles earthquake, (Palm, 1994). The San Fernando Section Emergency Coordinator activated the ARES emergency communications van at the San Fernando hospital for communications with area hospitals. The Los Angeles Section had more than 100 hams volunteer for communication services. Another ham checked in with the Southern California DX Club repeater and was able to relay a report to the Sheriff's disaster net that a high-pressure gas main had ruptured on Mulholland Drive. During the first two days he had to use his own emergency power generator since there was no electricity in the San Fernando Valley. Using 20 meters, he was able

to relay about 300 messages before telephone service was restored to the 818 area.

Seventy ARES operators checked in by radio with Ventura's ARRL Emergency Coordinator after the 4:31 AM earthquake. Most of them were assigned to provide communications for Red Cross shelters. There were more than 4000 messages forwarded into the San Fernando and Santa Clarita Valleys by amateur packet radio.

A ham in Arkansas tuned in to 14.245 MHz after he heard about the earthquake on the news and found someone in Washington state acting as net control. The band was fading so that he ended up as net control and handled 517 messages before turning the net over to someone else.

Preparedness For Disasters

Many cities, counties, and states are taking actions to invite amateur radio operators to volunteer their communication services in normal times in order to prepare for disasters. One of these cities is Martinez, California where the Chief of Police is also the Disaster Preparedness Director, (Boyd, 1991). The City Council decided to get a 30-foot motor coach and equip it as a mobile-command vehicle, called Control II. It is equipped with amateur TV, HF, VHF, SSB, and packet.

A county in Missouri has a highly active organization of ARES and RACES amateurs, (Schuchardt, 1992). The amateurs are organized much like a volunteer fire service association. They provide a mobile command post for communications support for floods, blizzards, search and rescue, hazardous chemical accidents and tornado spotting for the National Weather Service.

Amateur radio clubs, such as the Naval Postgraduate School Amateur Radio Club, have many members who participate in local ARES activities, (Bible, 1995). These members responded to the communications problems posed by the 1995 floods of the Carmel and Salinas Rivers.

Future Of Amateur Radio In Emergency Communications

In order for amateur radio operators to be able to contribute their help in emergencies, the local public officials should be aware of amateur radio capabilities and limitations. A survey of mayors, city managers, and city council members attending an annual Michigan Municipal League convention disclosed that 80% had never had contact with their local ham radio group, (Turner, 1990). This indicates that amateurs should take

appropriate action to educate their local authorities before some disaster occurs.

The amateur radio community has been studying disasters to investigate how they can provide emergency communications to organizations which are not as well prepared as are modern police, fire, and emergency medical units, (Boyd, 1995). Public works departments in cities and counties are key responders in large scale disasters. For example, they are becoming more involved in massive mutual aid assistance projects for debris removal and demolition of damaged structures. Many public works organizations have rather basic communications gear only usable within their home jurisdiction. This may cause problems when they are asked to respond to a different jurisdiction to furnish mutual aid. Assisting in this type of situation is an appropriate activity for amateur radio. Similarly, utility companies such as water, power, and sanitation agencies may need emergency communications assistance from amateur radio.

Both private and public transportation providers used to transport injured to medical treatment centers or evacuees to shelters may have only the most basic radio equipment. Many school busses have no radios. Amateur radio can provide two-way radio communications essential for prompt efficient assignments and coordination of transportation resources.

Hospitals may need amateur radio operators as backup communicators if the telephone system is down and cellular systems down or overloaded. In recent earthquakes and hurricanes, many hospitals have been severely damaged with large-scale relocations of patients necessary. Similarly, convalescent centers and retirement homes usually only have the usual telephone service. If many of the residents are non-ambulatory, there may be an urgent requirement for amateur radio emergency communications to support patient relocation and evacuation.

Childcare centers may also have tremendous problems if a disaster, such as an earthquake, were to occur when the children are there and the parents are at work. Amateur radio operators should be able to help with emergency communications. Also, many school systems may have basic communications equipment but may not be able to cope with damage to antennas and equipment after a disaster. Amateurs practice for emergencies with battery-operated gear and hastily erected antennas.

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Disaster Management in The Carmel River Floods

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DISASTER MANAGEMENT IN THE CARMEL RIVER FLOODS

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ABSTRACT

Carmel-by-the-Sea is a city in California, population about 5,000, which became internationally famous a few years ago when Cliff Eastwood was elected mayor. Carmel had been founded in 1776 by Father Junipero Serra who built a mission near the Carmel River. Carmel is near Monterey of Cannery Row fame and Pebble Beach, a golfers' paradise.

The Carmel River overflowed its banks during the night of 9 January 1995. There were no deaths or injuries. Some upriver residents who lived near the river were evacuated by firefighters and Deputy Sheriffs. However, several hundred residents who lived 14 miles downriver were very angry that they received no alerting, no warning, and no evacuation by public safety agencies. Some were awakened by neighbors to find river water three feet deep in their living rooms. Firefighters and volunteers evacuated many of them by boat.

The Monterey County Board of Supervisors established a Carmel River Flood Task Force to investigate what had happened and determine what went wrong so that corrective actions could be taken. This paper discusses the work of the committees of the task force with particular attention to the Neighborhood Preparedness Committee. This was a small disaster, but from a research viewpoint it provided useful lessons-learned type information. This information was examined in order to determine if the disaster planning and the standard operating procedures for emergency operations centers of neighboring cities needed to be revised.

Introduction

After the January 1995 flood of the Carmel River, questions were asked by angry residents concerning lack of alerting and evacuation of downriver homes by Monterey County public safety agencies when the

seriousness of the flooding upriver had been known for hours. The residents also questioned why no flood control projects had been undertaken after many years of study. And - residents asked themselves why they were not better prepared for floods.

The Carmel River Flood Task Force had four committees. Fact-finding Committee. Levees and Infrastructure Committee. Emergency Preparedness Committee. Neighborhood Preparedness Committee

The Task Force prepared its 'Carmel River Flood Task Force Final Report' in May 1995. The County Administrative Office prepared its 'Report on the Carmel River Flood of January 9th and 10th, 1995' for the Board of Supervisors meeting of February 28, 1995. The Task Force's information was based in part on the County's report but in the following discussions, some of the statements of the County seemed overly optimistic when compared to more comprehensive facts uncovered by the committees.

Fact-Finding Committee

This committee examined the factors that contributed to the January 1995 flooding disaster since preliminary newspaper reports alleged that: Monterey County's emergency operations center (EOC) was not activated early enough; The appropriate decision-making personnel did not come to the EOC when it was activated; No one was in charge in the EOC; Information from hydrologists about river heights and stream flow rates was ignored; No evacuation order was given by the EOC until residents finally managed to get word to the EOC that the river was overflowing and running down their street.

Emergency Operations Center

'The emergency operations center was activated at a 'cadre' (core members) level and functioned well during the flood.' (County report)

Comment: The Monterey County Herald, January 29, had a front-page headline 'Mission Fields residents grill public officials at flood hearing.' 'Angry Mission Fields residents vented their frustrations on public officials yesterday during the first public forum since their homes were flooded 2 ½ weeks ago.' With hindsight, many people felt that the EOC should have been activated on January 9 at least four hours earlier than 2355, and responsible decision-making personnel should have reported in as soon as possible. The facts were that some of the senior officials did not come to the emergency operations center during the emergency and did not arrive

in person until the next morning after the emergency was over. (Carmel Pine Cone, January 12, back page).

Chapter 2.68 of the Monterey County Code, 'Emergency Procedures and Organization' states that the Director of Emergency Services is tasked with the overall management, coordination, and control of emergency preparedness and response functions. The Director of Emergency Services shall designate the order of succession to that office, to take effect in the event the Director is unavailable to attend meetings or otherwise perform the duties of that office during an emergency (2.68.060 B). The order of succession on January 9 is unknown. Furthermore, no one came to the EOC to be in charge until 6:30 the next morning.

Interagency Coordination and Communication

'Inter-agency coordination and communications functioned well during the emergency.' (County report)

Comment: Many of the residents of Mission Fields who received no evacuation warning do not agree with this conclusion of the report. In fact, the Carmel Pine Cone, January 12, had a front-page headline, 'Flood victims blast county response; officials provide conflicting answers.' 'As a spokesman for the county Office of Emergency Services (OES) said that law enforcement was responsible for the evacuation call, Monterey County Sheriff Norm Hicks explained the evacuation order 'was not my decision' but that of the OES.'

The Monterey County Herald, January 15, had a front-page headline, 'Flood warnings arrived too late.' The (acting) emergency services coordinator, was quoted as saying he sent a fax at 10:30 p.m. Monday night to emergency agencies alerting them that the National Weather Service had issued a flood warning for the area, (EmerBull 5-4 in enclosure (2) County report). He then sent a second fax at 12:15 a.m. Tuesday saying that the Upper Carmel River has exceeded flood stage above Rosie's Bridge and flooding is expected, (EmerBull 5-3). This second fax was sent to the Sheriff, CHP, Carmel Valley Fire and Mid Carmel Valley Fire. However, because of confusion in the emergency operations center it was not sent to the dispatcher at the California Department of Forestry (CDF) Emergency Command Center in King City nor to the Cypress Fire District which serves Mission Fields. Consequently, the residents of the Mission Fields area received no official warning of the flood which then poured into many of their homes.

Lessons learned: 'California Department of Forestry (CDF) ECC (King City)' was added to the addresses of Emergency Services Bulletins beginning with EmerBull 517 on January 23,1995. (Note: The improvement of communications and interagency coordination between the County and the CDF is vital to the protection of Monterey County cities from the danger of a fire similar to the Oakland/Berkeley East Bay Hills 1991 fire when 3,354 houses were destroyed.)

The County's EOC needs to be physically manned by appropriate personnel. If the Director of the emergency operations center is out of town or actually unable to come to the EOC, the order of succession should produce someone. It would appear that no one was in charge and necessary decisions on such matters as alerting, warning, evacuation, manning, and requests for mutual aid were never made. Note: Other cities such as Pacific Grove, have orders of succession with five alternates for continuity of government.

The County EOC was not adequately manned. There were only two administrative staff present instead of the usual numerous helpers for updating situation status boards , documentation, updating resource status boards, messengers, answering the telephone, etc. The Public Information Officer was only there 'part-time.' Hydrologists were in and out and not present to provide technical advice when necessary. The Governor's Office of Emergency Services has an elaborate system for mutual aid for emergency managers to assist in the EOC. Additional emergency managers could have reported to the County EOC within a few hours since the OES Regional Office telephoned the EOC at 2300 and 0030 to request status reports. One of the requirements of cities and counties receiving FEMA grants is to participate in the State's mutual aid system. FEMA grants pay half of the salary of emergency managers.

Emergency Plans

*'The emergency plans applicable to this emergency were limited to the Monterey Coun*ty Multi-Hazard Emergency Plan. *This Plan, distributed on a limited basis, was employed during the emergency.' (County report)*

Comment: The distribution was indeed on a limited basis. None of the twelve cities of Monterey County had copies and none were available in County libraries for the public to read. Actually, the Plan did not discuss the possibility of flooding in the areas which received the most damage.

Evacuation

*'Assessment of the County's overall evacuation plans, policies, and procedures requires an examination of which agency or agencies bear the responsibility for in*itiating an on-scene evacuation *In the event of an evacuation, the principal responsibility for initiating an evacuation lies with the Sheriff. However, the practical decision to evacuate lies with the agencies having expertise with the type of incident, and it should be a joint decision involving all concerned.' (County report)*

Comment: The basis of the Incident Command System is to have one person in charge in the emergency operations center. In an ideal world, the technical advisors (Hydrologists) in the Planning Section would provide technical data on stream flow rates, river heights, and estimates of flooding to the Planning Section Chief. The planners would coordinate with Law Enforcement, Fire, and Public Works units in the Operations Section to prepare a plan for warning and evacuation of residents who might be flooded. The Director of the EOC would approve the plan and order the Operations Section Chief to implement the planned evacuation. This apparently was not done.

Levees And Infrastructure Committee

This committee's mission was to consider and recommend remedial solutions to prevent disastrous flooding in the future. After reviewing previous studies, it recommended that a Flood Control Zone and Community Benefit Assessment Districts be established. The purpose would be to provide funding for flood control planning activities and implement flood control projects. Funding is necessary for maintenance and operation of an alert system for providing flood warnings along the Carmel River.

Some actions recommended in 1989 to remove south bank levees have now been implemented. Some agricultural fields have been converted to riparian and wetlands habitat and some levees have been removed to create floodways to protect residential areas. It was also recommended that Monterey County and Carmel-by-the-Sea support a coordinated effort to improve the storm drainage system in the Rio Park area to prevent flooding of home in the Mission Fields area. Other recommendations about assessment districts have not yet been approved.

Emergency Preparedness Committee

The committee reviewed the operation of public and private agencies before, during, and after the flood. A number of recommendations were made. The committee recommended that the County Office of Emergency Services develop a uniform system of precautionary warning and alerting of residents and businesses of the possibility of flooding. Electronic monitoring equipment to determine river height and flow should be bought and installed. Visual depth markers should be installed at strategic locations to allow residents to recognize for themselves the potential for flooding.

Sandbags and other emergency supplies should be stockpiled. The present communications system should be redesigned and consolidated if feasible. A system needs to be developed for the Monterey County Sheriff's Department to coordinate traffic control for evacuations with the California Highway Patrol. The Sheriff should develop a system to protect flooded areas from looters. 'Restricted' signage, citizen patrols and deputies might be appropriate.

Neighborhood Preparedness Committee

This committee studied the problems of residents and neighborhoods along the Carmel River. The basic assumption was that the normal emergency response organizations may be overwhelmed in a severe flood. Each household and neighborhood should be prepared and organized to fend for themselves and assist one another. Each household should have emergency supplies, such as flashlights, a battery-operated radio, drinking water, food, first aid kit, candles, etc. Family members should be trained in first aid and know how to turn off their gas, electricity, and water utilities. Evacuation plans must be developed. Each family should prepare their home for floods, earthquakes, wildland fires and other disasters. Valuables and personal treasures should be safeguarded. Flood walls for the house or elevating the home may need to be considered.

Neighborhoods should consider forming homeowners' associations and disaster teams. They should have block captains, a river watch coordinator and a neighborhood disaster coordinator. Each neighborhood should conduct a survey of residents to locate people who are old, frail, or disabled, and families with young children. The survey should also identify people with special skills, such as nursing, and locate families with emergency equipment such as chain saws, cellular phones, and 4-wheel drive vehicles. The committee developed a 'Flood and Disaster Guide', see

Appendix A. This Guide includes suggested lists of emergency supplies, emergency telephone numbers and evacuation information. The Guide was printed in a bright color, inserted in a plastic envelope and was designed to be posted on the refrigerator door in the kitchen.

Carmel River Flood Of March 1995

The Carmel River flood of January 9-10, 1995 was a disaster where the response had many problems. Some of these problems were caused by confusion in the emergency operations center and lack of training of key personnel. Although the Carmel River valley residents whose homes were flooded believed that another flood might not occur for perhaps 20 years or so, within two months an even more severe flood came in March 1995. The Route 1 highway bridge over the Carmel River was washed away and the Monterey Peninsula cities of Carmel-by-the-Sea, Pacific Grove, Monterey, Seaside, and Marina were isolated from the rest of the county for more then 24 hours. The County activated its emergency operations center and declared a local emergency at 0700 on March 11, 1995. The EOC remained in full continuous operation until 0200 on March 14, 1995. Some residents of the Carmel River valley were evacuated. There were no injuries or deaths. It is ironic that water depths inside homes were higher in the March flood than in the January flood. However, the overall response of the appropriate agencies was much improved because of the beneficial training they had received during the January flood.

Conclusion

This is a story with a happier ending than might have been expected. The disaster of the January flood had galvanized both governmental and non-governmental agencies into taking corrective action and training. The performance in the March flood demonstrated what might be accomplished by coordinated cooperative efforts.

The former members of the Neighborhood Preparedness Committee of the Carmel River Flood Task Force held a meeting on August 1, 1996 and organized a 'Carmel River Residents Flood Preparedness Committee.' The new committee intends to coordinate flood preparedness activities of the various homeowner associations along the river, sponsor neighborhood emergency response team training, and have an annual

'Flood Disaster Awareness Week' in November before the rainy season begins.

References

Monterey County Administrative Office, 'Report on the Carmel River Flood of January 9th and 10th, 1995' prepared for the Board of Supervisors meeting February 28, 1995.

Carmel River Flood Task Force, 'Final Report', prepared for the Monterey County Board of Supervisors and Residents of the Carmel River 100-Year Flood Plain, May 1995

Monterey County Administrative Office, 'Report on the Monterey County Floods of March 9-15,1995' prepared for the Board of Supervisors meeting October 10, 1995.

APPENDIX A: Post Guide Prominently in Your Home in the Kitchen

CARMEL RIVER NEIGHBORHOODS FLOOD AND DISASTER GUIDE

EMERGENCY TELEPHONE NUMBERS
911 - Emergency (if life or property are threatened)
Disaster Information
647-7911 - Sheriff's Non-Emergency Line
755-5010 - Disaster Situation Information (OES) Recorded Messages
755-3991 - Disaster Conditions (OES)
649-1993 - Carmel River Conditions (Water Mgt)
EMERGENCY INFORMATION RADIO FREQUENCIES
primary: KSCO - 1080 AM
secondary: KBOQ - 95.5 FM
KTOM - 1380 AM / 100.7 FM
KOCN - 104.9 FM
also: local TV News
NOAA Weather Radio 162.55 MHz

IF YOU NEED TO EVACUATE, DO THESE THINGS:

If an Evacuation order is given, leave home within 20 minutes and take these things:
Prescriptions/medications/eyeglasses
Personal address book
Money/checks/credit cards

Driver's license
Insurance papers: home, flood, health, car
Pets, leash, pet food
Irreplaceable photographs & keepsakes
Clothing & toilet items
Keys: home, car, safe deposit, business
Home inventory info

IF TOLD YOU HAVE MORE TIME TO EVACUATE, CONSIDER:

1. Removing other items of value - collections, family heirlooms, computers
2. Elevating items above possible flood water
3. Turning off electricity, gas and water

If told you must evacuate, do so quickly. Any delay threatens the safety of your family and rescue workers. Also you should assume that once you leave you will not be allowed back.

EMERGENCY SUPPLIES TO KEEP STOCKED AND HANDY

Battery-operated flashlights and radios, with extra batteries, plus candles and matches
Several fire extinguishers
Drinking water and nutritious food that needs no cooking
Medicines, first aid kit, and personal hygiene items
Clothing for an evacuation, including warm jackets and raingear
Basic tools (knife, screwdrivers, pliers, hammer, rope, etc)
Keep vehicle fueled
Battery-operated weather radio, scanner, cellular telephone

MAKE A FAMILY EVACUATION PLAN

Plan escape routes from house and where to meet outside
Determine where you could find each other if the family does not evacuate together, such as at relatives, friends, or evacuation center
If you have children, know the school's evacuation plan
Register at the official evacuation center so others can locate you

PREPARE YOUR HOME AND YOURSELF

Organize your home with floods and other disasters in mind:
Keep valuable items up high, not down low

Identify your most important valuables (pictures, documents, insurance papers, keys, etc.) and keep them accessible; if possible, keep copies of these items at a safe location away from your home

Prepare a home inventory, and store a copy in a safe place away from your home

Seek professional guidance to prepare or modify your home (for homes especially vulnerable to floods).

Review First Aid and Survival Guide on pages B1-B12 in Telephone Book

Prepared by the Neighborhood Preparedness Committee of the Carmel River Flood Task Force - April 1995

Disaster Management Conferences on the Internet

DISASTER MANAGEMENT CONFERENCES ON THE INTERNET

Russell C. Coile, Ph.D, CEM
Pacific Grove Fire Department, Pacific Grove, California

ABSTRACT

The Internet now offers a new approach for improving the sharing of information on disaster management concerns and research among emergency management practitioners. Three examples will be discussed in this paper.

The University of Bradford in England organized an international disaster management virtual conference on the Internet from June 1 through August 31, 1996, instead of hosting another traditional disaster conference at the University which it had done each year between 1989 and 1993.

The United Nations Secretariat for the International Decade for Natural Disaster Reduction (IDNDR) and the Regional IDNDR Office for Latin America and the Caribbean in San Jose, Costa Rica, organized an internet conference August 16 to October 16, 1996, as part of the IDNDR 'Cities at Risk' public awareness campaign.

FEMA has a Preparedness, Training and Exercise Directorate. The Preparedness Branch of the Training Division has a Family Preparedness Program. This program's 'Partnership in Action' project held a discussion conference on the Internet on June 20, 1996, and plans to have another Internet conference in November 1996.

University of Bradford, UK

The University of Bradford's Disaster Prevention and Limitation Unit held a traditional international conference on disasters every year between 1989 and 1993 in England. The costs of airplane travel, hotels, meals, and conference registration, however, were obstacles which made it difficult or impossible for many interested would-be participants to get travel funds or the allocation of time to actually go to England for the conference. Professor Alf Keller, Director of the Disaster Prevention and Limitation Unit, therefore, decided to organize a conference on the Internet. The Virtual Conference

Center of MCB University Press conducted this First Internet Conference on Electronic Communication and Disaster Management from 1st June through August 1, 1996, at its web site http://www.mcb.co.uk/confhome.htm

The Organising Committee for this virtual conference included: Chairman: Dr. A.Z. Keller, university of Bradford; Mr. Eric Alley, OBE, President, Institute of Civil Defence and Disaster Studies; Dr. Eric Dykes, Civil Emergencies Centre, University of Hertfordshire; Professor Hayim Granot, Bar-I-Lan University, Israel; Professor E.L. Quarentelli, Disaster Research Centre, University of Delaware, USA; Dr. S.W.A. Gunn, President, World Association of Disaster and Emergency Medicine; Professor Denis Smith, Centre for Risk and Crisis Management, University of Durham; Mr. Keith Cassidy, Head, Major Hazards Assessment Unit, Health and Safety Executive, UK; and Secretary, Ms. E.L. Coles, Centre for Risk and Crisis Management, University of Durham.

It was intended that this conference would be the first in a series of annual conferences and would prove a natural evolution from the five traditional conferences (1989-1993) initiated by the Disaster Prevention and Limitation Unit at the University of Bradford, UK.

Papers presented during the conference included:

'Problematical Aspects of the Information/Communication Revolution for Disaster Planning and Disaster Research: Ten Non-Technical Issues and Questions.' Professor E L Quarantelli, Disaster Research Centre, University of Delaware, CSA

'Emergency Communications: A Step Toward Standardization.' Ghislain Demers, University of British Columbia, Canada

'Using the WWW as a Medium to Teach Disaster Management: Notes on a Course in Progress.' Dirk H R Spennemann, Charles Sturt University, New South Wales, Australia

'The Role of Amateur Radio in Providing Emergency Electronic Communication for Disaster Management.' Russell C Coile, Ph.D, FICD, Disaster Coordinator, Pacific Grove Fire Department, California, USA

'On a Wing and a Prayer? Exploring the Human Components of Technical Failure.' Professor Denis Smith, Durham University Business School, UK

'Tasmanian Lifelines Project.' John Lunn, Tasmanian State Emergency Service, Australia

'Emergency Inter-Organisational Relationships.' Professor Hayim Granot, Bar-Ilan University, Israel

'No introduction Necessary.' Neil Hayes, Emergency Planning Unit, Manchestcr FCDA, UK

'A Global Emergency Management Information Network Initiative: GEMINI.' Albert J Simard, Canadian Forest Service Forest Fire Coordinator

'The Canadian Wildfire Fire Information System.' Albert J Simard, Canadian Forest Service Forest Fire Coordinator

'Disaster Schemata and the School Curriculum.' Dr John Lidstone, Queensland University of Technology, Australia

The papers were posted on the Internet. All registered participants were invited to send in questions or comments on the papers. The authors then answered the questions and provided further discussion of the issues raised.

International Decade for Natural Disaster Reduction

The United Nations Secretariat for the International Decade for Natural Disaster Reduction (IDNDR) and the Regional IDNDR Office for Latin America and the Caribbean in San Jose, Costa Rica, organized an Internet conference August 26 - October 16, 1996. The theme of the conference was 'Cities at Risk.' The call for participation said,

'Are the cities of today and tomorrow waiting for catastrophes to happen? Every day, there are news reports concerning cities stricken by disasters. These events are likely to continue, and become worse, unless we change our policies and actions regarding environment and development.

'What is the conference? The 1996 IDNDR Conference, 'Solutions for Cities at Risk,' is a forum to exchange ideas and practical solutions on how city authorities and concerned citizens can protect their cities from natural disasters.

'Who will be involved? City administrators, national government authorities, NGOs, UN agencies, universities, scientific organizations, businesses ... people from all world regions with an interest in issues related to the environment, development and disasters.

'Why participate? Learn what communities around the world are doing to protect themselves from disasters. Pose questions to those directly involved in city programs to see how their activities could be adapted to your own work. Present your urban disaster mitigation experiences for discussion and feedback. Consult experts in many different professions about disaster mitigation issues.

'Conference goals: The emphasis of this conference will be on the exchange of practical solutions that city authorities and concerned citizens can adapt to their own local needs. The conference aims to: Encourage urban authorities and community leaders to protect cities from disasters. Gather 'Success stories' of urban disaster mitigation that can be adapted in various cities around the world. Identify policies and 'lessons learned' that may be adapted to local circumstances. Facilitate networking, partnerships, and exchanges between all organizations interested in making cities safer from disasters.

'The Internet conference is taking place August 26, 1996, to October 25, 1996. The World Wide Web Home Page is: http://www.quipu.net/risk/'

The organizers used electronic mail to send the papers and to receive questions and comments. Messages were sent to: risk@thecity.sfsu.edu.

English was the working language, but guidelines were available in French and Spanish. Participants registered by sending an e-mail message to: listserv@thecity.sfsu.edu with the message: subscribe risk [your-first-name your-last-name] (Example: subscribe risk James Witt) (substituting your own first and last name for 'James Witt')

This initiative, organized by the United Nations Secretariat for the International Decade for Natural Disaster Reduction (IDNDR), is part of the 1996 TDNDR 'Cities at Risk' public awarencss campaign. Anyone wishing to receive campaign materials to help carry out local activities or receive additional information about the Internet conference should contact:

Natalie Domeisen IDNDR Secretariat
UN Department of Humanitarian Affairs
Palais des Nations
CH-1211 Geneva 10 Switzerland
Tel: ++41-22 / 7986894
Fax: ++41-22 / 7338695
E-mail: idndr@dha.unicc.org
The IDNDR WWW Home Page is:
http://hoshi.cic.sfu.ca/hazard/idndr.html

Family Preparedness Program

The third example of Internet conferences is a FEMA project organized by FEMA Preparedness, Training and Exercise Directorate. The Training

Division's Preparedness Branch has a Family Preparedness Program. The goal of this program is to have the American public better prepared about what to do before, during and after a disaster. The Family Preparedness program intends to help emergency managers develop partnerships with businesses, schools, industry and community organization, and to disseminate disaster preparedness information, including using the Internet.

FEMA has begun to develop its own national partners. This initial group includes the American Red Cross, National Weather Service, Boy Scouts of America, Girl Scouts of the U.S.A., AFL-CIO Community Services, National Sheriffs' Association, Camp Fire Boys and Girls, and the National Association for Search and Rescue.

The Family Preparedness program's 'Partnership in Action' project held its first conference on the Internet on June 20,1996. The World Wide Web Home Page was: http://www.partner.org/actnow

The conference was opened by Kay Goss, FEMA Associate Director for Preparedness, Training and Exercises with greetings from President Clinton and Director James Lee Witt. The facilitator was Ralph Swisher, Family Preparedness program manager. FEMA had gathered a panel of experts to answer questions submitted over the Internet. The experts were: Rocky Lopes of the American Red Cross Community Education Department; Bob Johnson, Chairman of the National Coordinating Council on Emergency Management Family Preparedness Task Force; Janet Clements of the Virginia Department of Emergency Management; Barbara Patasce, Public Fire Education Specialist for the United States Fire Administration; and Pat Moore, a Cerfified Disaster Recovery Professional, Fellow of the Business Continuity Institute. FEMA invited anyone interested to register for the conference and submit questions for the experts during the initial two-hour period.

The registration process is intended to build up a national resource bank of people interested in emergency management. The information inserted by the participants indicates their individual skills, accomplishments and interests. The resource bank makes it possible for individuals to contact others of like interests.

FEMA plans to have its second Family Preparedness Internet conference in November 1996.

Conclusion

These examples illustrate only some of the types of use of the Internet for emergency management. It is to be hoped that technological advances will continue to evolve to help us with the dissemination of disaster preparedness information.

Information on disaster research and these Internet applications is available from the Natural Hazards Research and Applications Information Center of the University of Colorado, Boulder. The Center publishes an electronic newsletter DISASTER RESEARCH. To subscribe or unsubscribe send a message to: listproc@lists.colorado.edu To subscribe, send this one-line command in the body of your message: SUBSCRIBE HAZARDS Your Name

A printed bimonthly newsletter, the 'Natural Hazards Observer' is also available and is free. Subscription requests for the Observer should be sent to:

Natural Hazards Research and Applications Information Center
Attn: Janet Clark, Publications Clerk
Campus Box 482
University of Colorado, Boulder, Colorado 80309-0482
Tel (303) 492-6819
Fax (303) 492-2151

Comprehensive Disaster Planning For Earthquakes

COMPREHENSIVE DISASTERPLANNING FOREARTHQUAKES
Russell C. Coile, Ph.D., CEM Disaster Coordinator
Pacific Grove Fire Department. Pacific Grove

ABSTRACT

California is not just 'Disneyland' it is also 'Disaster land' with earthquakes, tsunamis, floods and fires. California is the largest in population of the 50 states with more than 30 million residents. It also seems to have experienced more disasters than any of the other states in recent years. Because of these numerous disasters, a system of comprehensive disaster planning for earthquakes and other disasters has been developed and implemented in California. 'Comprehensive' means disaster preparedness planning by: individuals, families, neighborhoods, schools, cities, counties, the State, Federal agencies, non-governmental collaboratives of community based organizations, businesses and industry. Planning for large earthquakes requires a worst-case scenario with no warning, the chaos of damaged highways, damaged or collapsed buildings, no electricity, no gas, no telephone, no water, and no sewer systems. Fires usually add to the damage.

Pacific Grove is a small city but would serve as a well defined model for comprehensive disaster planning for earthquakes. First, the City has a disaster preparedness education program for individuals and families through local organizations and civic clubs, homeowner associations, local newspapers, and radio and television stations. Second, the local schools have active educational programs for disaster preparedness. The Fire Department has an educational trailer for teaching elementary children, and the Middle School has earth science courses to teach preparedness for earthquakes, oil spills and hurricanes. Third, the Fire Department has a training program for neighborhoods called 'Volunteers in Preparedness' which organizes neighborhood emergency response teams including amateur radio operators. Fourth, all city employees are being trained in the State of California's new 'Standardized Emergency Management System,' adopted in December 1996. This new system is designed to facilitate olle city providing mutual aid to another city, and one county providing

additional resources to another county, with further backup from all over the State. Fifth, the Federal Response Plan will marshal the resources of 26 government agencies to help a state in a Presidentially-declared disaster. Sixth, non-governmental community-based organizations will be increasingly important. The American Red Cross not only has its key traditional role in providing mass care and shelter for earthquake victims, but here in California, is also assisting in the formation of collaborative associations of community-based organizations for disaster services. Seventh, California businesses and industries have learned the value of cost-effective business-continuity planning for efficient business recovery the hard way from past earthquakes.

The purpose of this paper is to provide a concise update on these evolutionary and revolutionary disaster management activities in California. There may be lessons learned from past earthquake disasters in California and the resulting development of our comprehensive disaster preparedness planning which might be interesting and appropriate for other cities.

Introduction

Individuals and Families

California has experienced two earthquakes and a variety of other disasters such as floods and fires during recent years. A system of 'comprehensive' disaster planning evolved which starts with individuals. Ideally, individuals should take responsibility for their own mitigation and preparedness. They should consider what is feasible, prudent and cost-effective to do to prepare for disasters. Earthquakes provide a convenient scenario - no warning, damage to highways and buildings, no electricity, no telephone, no gas, no water, no sewer system, etc. Individuals should consider disaster preparations they might do at home, at the office, or en route in an automobile. Next, individuals should consider what disaster preparedness measures would be appropriate for their families. The Disaster Coordinator at the Fire Department gives disaster preparedness talks to local organizations such as the Rotary Club, lions, Kiwanis, Pacific Grove Chamber of Commerce, Meals on Wheels, senior citizen groups, mobile home parks, and homeowner associations. Earthquake preparedness is taught at the Pacific Grove Police Department's Citizens' Police Academy. Public education efforts also include articles written for the local newspapers, radio and television public service announcements,

and special programs. The Pacific Grove Public Library has free earthquake preparedness literature in English, Spanish, Tagalog, Cambodian, Laotian, Chinese, Hmong, and Japanese.

Schools

The Pacific Grove Fire Department has a comprehensive program for teaching earthquake preparedness and fire safety to elementary school children in the first, second, and third grades. The American Red Cross' Northern California Disaster Preparedness Network gave a grant to the Fire Department to purchase an earthquake and fire safety trailer. This trailer is available for all the fire departments in the tri-county region of Monterey, Santa Cruz and San Benito counties to use at elementary schools. The trailer is actually a two story house built to scale to the height of the average six-year old child. The 1st, 2nd, and 3rd graders are taught how to telephone 911, the basic principles of earthquake preparedness, and how to 'duck, *cover* and hold-on' under a table or desk. With one of the pupils upstairs in bed, the firefighter-instructor releases smoke simulating a fire. This activates a smoke alarm. The child is taught how to crawl, not run, to the bedroom door and how to always touch a door before opening it. The instructor can make the door warm, simulating a fire on the other side, so that the child does not open it, but finds an alternate escape route through a window. The children thus learn fire safety and are given appropriate coloring books and preparedness literature to take home for their parents to read to them.

Children in grades 6-9 in Pacific Crove are able to study disaster preparedness through a program called Event-Based Science. The National Science Foundation funded the Montgomery County (Maryland) Public Schools with a million dollar grant to develop event-based middle school science projects (Wright, 1995) The Exxon Valdez oil spill, the '1989 California Loma Prieta earthquake, and Hurricane Andrew are the focus events for the initial units called Oil Spill!, Earthquake!, and Hurricane! Each unit begins with about ten minutes of CNN newscoverage of the disaster and *USA Today* news articles. The students carry out hands-on scientific experiments, complete challenging real-world tasks in cooperative groups with associated English, math, social study and technology aspects, and prepare comprehensive reports.

Neighbors

The Los Angeles Fire Department, and later the San Francisco Fire Department, decided to approach neighborhood associations to train

neighborhood emergency response teams (NERT). The reason is that the Fire, Police and Public Works Departments will probably be overwhelmed in any large-scale disaster. There may not be enough fire fighters to try to put out numerous simultaneous fires or rescue disaster victims trapped under earthquake rubble. There are 74 cities in central California now with training programs for neighborhood emergency response teams taught by instructors trained by the San Francisco Fire Department. There are 6000 trained neighborhood emergency response team members in San Francisco organized to report to 11 fire stations. In the city of Pacific Grove, we call our program 'Volunteers in Preparedness.' The program consists of six classes: Earthquake Preparedness in the Home; Utility Control and Hazardous Materials in the Home; Disaster Medicine; Search and Rescue; Volunteer in Preparedness Team Management and Amateur Radio; and Fire fighting training with fire extinguishers and training in rescue operations.

The cost of materials for each student is $30 for a hard hat, identification vest, and firefighting materials. The volunteers use amateur radio operators who live nearby to pass information to the City's emergency operations center. (Coile, 1997)

Cities

In October 1991 there Wi1Sa disastrous fire in Oakland and Berkeley. This 'East Bay Hills' fire caused 25 deaths and 1:50injuries. There were 3,354 houses and 456 apartments destroyed. This was the worst urban fire in the history of the United States with an estimated cost of $1.5 billion.

According to the official 'lessons-learned' report prepared by the East Bay Hills fire Operations Review Group, a number of factors contributed to poor performance by the Oakland and Berkeley fire departments. The weather made firefighting almost impossible with high temperatures of 92 degrees Fahrenheit, low relative humidity of 16 percent, and strong winds of 30 knots gusting to 50 knots. The streets were narrow and clogged with the burned-out hulks of a thousand automobiles.

There were also important organizational problems. The Oakland Fire Department did not use the Incident Command System and had no formal mutual aid agreements. The Fire Department moved its command post to three different locations during the fire, while the Police Department established two different command posts. It was difficult for the Governor to find out who was in charge and what was going on. Furthermore, the Oakland Fire Department had a different size fire hydrant coupling from

other California cities so that mutual aid engines from other cities needed to use an adapter which was in short supply. The Oakland Fire Department's budget had been cut so much in the preceding ten years that about 40% of the personnel had retired without replacement, and there had not been money for wild land fire-training. With little money for modernization, the fire engines had antiquated four channel radios instead of more modern sixteen-channel radios. This made it difficult to communicate with the 300 mutual aid fire engines which had arrived to try to help.

State Senator Petris, whose home in Oakland had been burned, prepared the draft of Senate Bill 1841 which was approved by the state legislature and signed by the Governor. This law is found in Section 8607 of the Government Code. The intent of the law is to improve the coordination of state and local emergency response in California. The new 'Standardized Emergency Management System' (SEMS) was effective December 1, 1996.

SEMS Training

Because this is a new system, a comprehensive training program was developed for all emergency personnel. Four courses were developed by the Governor's Office of Emergency Services and all city, county, and state employees were to get appropriate training.

Basic Components of SEMS

The new Standardized Emergency Management System was based on improvements to existing systems and some new concepts. These components are:

The Incident Command System (ICS) The ICS as developed by FIRESCOPE will be used at the field level by all responders.

Multi-Agency Coordination — Multi-agency coordination is the coordination among different agencies within a jurisdiction, such as Fire and Police. Inter-agency coordination takes place between different levels, such as city police, county deputy sheriffs, state police and California Highway Patrol officers.

A Master Mutual Aid Agreement — State, counties and cities originally signed a master agreement in 1950. This has been further developed to cover fire, law enforcement, coroner, emergency medical and search and rescue systems.

Operational Areas — An operational area consists of a county and all political subdivisions within that county's area.

The Operational Area Satellite Information System (OASIS) — A satellite communications system with a high frequency radio backup installed at each of the 58 counties, the regions, and the State.

Counties

California is divided into 58 counties and each county with all of its cities and special districts became an operational area for disaster purposes on 1 December 1996. SEMS organizes mutual aid so that one county may provide a city in distress with mutual resources from other cities.

State

The Governor's Office of Emergency Services at the State level established three Regional offices for disaster administration. The Coastal Region emergency operations center in Oakland can request resources from other counties to help the counties surrounding Pacific Grove.

Federal Government

The Federal government has a Federal Response Plan to coordinate the disaster activities of 26 agencies. The Federal Emergency Mana8ement Agency (FEMA) is in charge of these efforts and will coordinate federal assistance with the State.

Non-governmental community-based organizations

The American Red Cross provides mass care and shelter to disaster victims and Red Cross volunteers have raised money to pay for providing temporary shelter, meals, clothing, and essentials to earthquake victims to help them recover from disasters. Now, the local Red Cross chapters in California have been given grants to help organize the numerous non-profit organizations such as food banks into communitv collaborative associations for coordination of disaster activities. There are more than 400 such non-governmental organizations in Monterey County. The Red Cross chapters are assisting them in writing disaster plans and preparing for collaborative activities.

Business and Industry

Cost-effective and prudent disaster preparedness mitigation activities are underway in many businesses and industrial organi7.ations. What started

with an emphasis on contingency planning for computerized accounting systems by off-site storage of backup computer files has blossomed into thorough business recovery disaster planning.

Training

The State of California has an annual statewide earthquake exercise scheduled for the first Tuesday of April each year. For example, the announcement for the 1997 exercise in the City of Pacific Grove was as follows:

Statewide Earthquake Exercise, 10:30 A.M., April 1, 1997

1. The City of Pacific Grove will participate in the State of California's earthquake exercise scheduled for Tuesday, April 1, 1997. The City's emergency operations center will be activated at 10:00 a.m. at the Community Center, 515 Junipero Avenue.

2. The exercise will proceed in the context of a 'BIG' earthquake. It will be assumed that the following conditions will prevail after 10:30 a.m.: no electrical power; no gas; no telephone service and cellular service is overloaded; water pipes broken; and sewer pipes broken

Earthquake damage to local highways, to bridges over the Salinas River, and to overpasses and underpasses on Routes #1 and #68 has resulted in access problems. Earthquake damage to PG&E power generating stations at Moss Landing and other locations, and to switching facilities and transmission lines has resulted in a lack of electrical power for Pacific Grove (scenario assumption loss of power for one week.) Earthquake damage to telephone switching facilities and telephone lines has resulted in an initial lack of regular telephone service (scenario assumption no telephone service of any kind for one week). Earthquake damage to water, sewer, and gas pipelines has been widespread in Pacific Grove (scenario assumption no resumption of services for two weeks). Earthquake damage to unreinforced masonry structures has been extensive. Earthquake damage to housing has resulted in approximately 17% (Kobe, Japan experience) of the population of Pacific Grove displaced from their homes and 10% of these requiring temporary shelter and feeding, (scenario assumption — Residents needing shelter 274). Earthquake damage has resulted in 0.35% of the population (Kobe experience) in Pacific Grove dead, and 2.34% injured (Kobe experience), requiring first aid and/or hospitalization, (scenario assumption — Dead: 57, Injured: 377).

3. Preliminary planning for the exercise includes the following events:

10:00 a.m. Activation of the City's emergency operations center at the Community Center, 515 Junipero Avenue, based upon an earthquake prediction message received from the State OES.

10:30 a.m. Earthquake!

The City of Pacific Grove's Damage Assessment Team may be activated under the direction of the Chief Building Inspector and begin damage assessment surveys.

The following organizations may conduct an earthquake evacuation exercise after the 10:30 a.m. earthquake: Hopkins Marine Station, Stanford University; Monarch Pines Homeowners Association.

The Monterey County Chapter American Red Cross in Salinas will send a shelter management team and an emergency response vehicle (complete with amateur radio station) to Pacific Grove. The team has a Red Cross trailer which contains cots, blankets and comfort kits. Monterey County Red Cross may need to request mutual aid assistance from the cluster of nearby Red Cross chapters, such as Carmel-by-the-Sea and Santa Cruz.

The Monterey Bay Search Dogs, Inc. will be requested to provide urban rescue search dogs to find survivors buried alive in (pretend) earthquake rubble of collapsed buildings. The search operation will be conducted at the City's Corporation Yard, 2100 Sunset Drive at 11:00 am

Radio station KOCN will set up a portable remote facility at the emergency operations center so that the Mayor and City Council members can make live broadcasts to residents of Pacific Grove.

Pacific Grove amateur radio operators will set up amateur radio stations at the emergency operations center, at evacuation sites, at the search dog operation site, at Community Hospital, and at Red Cross shelters.

The Salvation Army will activate its headquarters amateur radio station in Seaside and send its emergency canteen vehicle to Pacific Grove to provide coffee and lunch to disaster workers at the emergency operations center.

Troop 90, Pacific Grove Boy Scouts will provide scouts for duty as pages at the EOC to deliver messages, run errands, escort visitors and assist with security.

The Volunteers in Preparedness (VIP) neighborhood emergency response teams who are registered disaster service workers will be activated in their respective neighborhoods. These teams, assisted by assigned Boy Scouts

and amateur radio operators, will collect preliminary damage information in their neighborhoods and report by amateur radio to the EOC. The VIP teams will conduct search and rescue operations in their neighborhoods as well as provide emergency utility control, disaster medical attention, and assistance to earthquake victims.

Conclusion

The State Geologist has estimated a 67% probability that a large earthquake of the magnitude that damaged San Francisco in 1906 will occur in California within the next 30 years. Many residents take this prediction seriously and have undertaken prudent disaster preparedness activities. In our small city, a comprehensive program has been adopted. Children are shown the basics of earthquake preparedness and hopefully carry the messages back home to their parents. Middle school students are old enough to carry out student projects and learn important facts for themselves. The Volunteers in Preparedness training program for adults and high school students teaches them fire fighting and rescue techniques. Residents learn how to organize their neighborhoods and work with the amateur radio operators who live nearby.

These evolutionary and revolutionary developments in California are based on honest efforts to remedy shortcomings in mitigation, preparedness, response and recovery revealed in past earthquakes, fires and floods. The State of California has used the introduction in 1996 of the new Standardized Emergency Management System to emphasize the importance of disaster preparedness, planning, and training for all state, county, and city employees.

References and Notes:

Wright, Russell G. (1995). Event-Based Science - Earthquake! ISBN 0 201 490900 Student Edition, ISBN 0 201 494 159 Teacher's Guide. (Other units in this series include: Oil Spill!; Hurricane!; Asteroid!; Toxic Leak!; Flood!; Volcano!; and Tornado!) Scott Foresman Addison Wesley Publishing Company, 1 Jacob Way, Reading, Massachusetts 01867 (800) 552-2259, fax (800)333-3328 (http://www.awl.com)

San Francisco Fire Department, Neighborhood Emergency Response Team Training Office, 260 Golden Gate Avenue, San Francisco, CA 94102-3706 (415) 558-3456 fax (415) 928-3130

Nert Student Manual and other information. (http://www.slip.net/-nertsffd/)

American Red Cross earthquake preparedness literature at local Red Cross Chapters: Are you ready for an earthquake, ARC 4455; Your family disaster plan, ARC 4466; Emergency Preparedness Checklist, ARC 4471; Your Family disaster supplies kit, ARC 4463; Emergency Management Guide for Business and Industry, ARC 5025 (http://www.redcross.org)

Earthquakes: a Survival Guide for Seniors. California Governor's Office of Emergency Services (OES), Coastal Region Earthquake Program, 1300 Clay Street, Suite 400, Oakland, CA 94602, (510) 286-0895 (http://www.oes.ca.gov)

FEMA Publications Catalog, FEMA-20. Federal Emergency Management Agency, P.O.Box 70274, Washington, DC 20024 (http://www.fema.gov)

Coile, Russell C. (1997). The Role of Amateur Radio in Providing Emergency Electronic Communication for Disaster Management. Disaster Prevention and Management, Vol. 6, No. 3 (http://www.sp.nps.navy.mil/npsarc/k6ly.html)

Amateur Radio Emergency Service information (http://www.arrl.org)

Emergency management information (http://www.disasters.org/emgold)

Standardized Emergency Management System (SEMS) Regulations. Chapter 1, Division 2, Title 19 California Code of Regulations, Government Code Section R607(a)

Disaster Resistant Communities in the United States

DISASTER RESISTANT COMMUNITIES IN THE UNITED STATES
Russell C. Coile, Ph.D, CEM
Disaster Coordinator
Pacific Grove Fire Department

SUMMARY

This memorandum is a brief status report on 'disaster resistant' communities. The Federal Emergency Management Agency (FEMA) announced a new program called 'Project Impact: Building a Disaster Resistant Community' on November 6, 1997. The objective of this initiative is to encourage local communities to undertake actions that will protect families, businesses and the community by reducing the effects of natural disasters.

The United States has had an increasing number of hurricanes, floods, earthquakes, severe storms and fires in recent years. The economic damage and disruption of normal living has also increased. FEMA now believes that local communities should assume more responsibility for preparing for disasters rather than just waiting for the Federal government to step in after a disaster to try to help the locals recover.

The basic concepts of this initiative include: Mitigation is a local issue - there should be a partnership of government, business and private citizens. Private sector participation is essential - disasters threaten the economic well-being of our communities. Mitigation is a long-term effort that requires long-term investment - all stakeholders must realize that this will be a worthwhile investment.

FEMA has taken several actions to get this program established all over the United States. The first action was to issue a 'Project Impact Guidebook' which outlines how communities might start their own local project. FEMA suggests four steps:

1) Building Community Partnerships - forming a 'Disaster Resistant Community Planning Committee' with representatives of the local government, state and federal disaster agencies, local business, labor, environmental groups, and local citizens.

2) Hazard Identification and Hazard Vulnerability - the first tasks of the Planning Committee would be to identify the local community's risks for natural disasters and then to assess the community's vulnerability to these risks.

3) Identifying and Prioritizing Risk Reduction Actions in Your Community - based on the possible particular disasters to this local community and the estimated vulnerabilities, the community should explore possible mitigation and preparedness actions and establish priorities.

4) Communicating Project Impact to your Disaster Resistant Community - the community must be educated to understand the importance of working together in a partnership to support the recommended mitigation actions.

FEMA's next action was to select seven communities in different areas of the United States. Each will develop a plan to become a 'disaster resistant' community. These pilot communities are: Oakland, California; Seattle, Washington; Pascagoula, Mississippi; Deerfield Beach, Florida; Allegany County, Maryland; Tucker and Randolph Counties, West Virginia; and the City of Wilmington/New Hanover County, North Carolina.

For example, the City of Oakland signed an agreement with FEMA on January 23, 1998 and was designated a 'disaster resistant' community. FEMA will give the city $679,000 seed money to undertake its hazard analysis, risk assessment and the planning of home/business strengthening programs. Earthquakes, severe winter storms/flooding and wildland fires have all occurred in Oakland within the past eleven years.

Two other initiatives relevant to disaster resistance or sustainability will be briefly reviewed. The Institute of Business and Home Safety in Boston has a Showcase Community project sponsored by the insurance industry which has many of FEMA's goals. The Department of Energy's Center of Excellence for Sustainable Development is involved with a number of communities in the United States which have begun to develop and evaluate quantifiable and relevant indicators of sustainability and quality of life indicators.

The City of Pacific Grove which received national recognition in May 1997 for its earthquake preparedness program when FEMA included 'Pacific Grove - A Model for Small City Disaster Preparedness' in FEMA's Compendium of Exemplary Practices, Volume II is currently exploring becoming a disaster resistant community.

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Introduction

The United States seems to have experienced an increasing number of hurricanes, floods, earthquakes, tornadoes, severe winter storms and fires in recent years. The cost of recovery actions has similarly increased. Economic damage in the United States in 1996 as a result of weather disasters cost more than 10 billion dollars. FEMA now believes that local communities should assume more responsibility for preparing for disasters in order to attempt to reduce damage and to reduce the subsequent recovery costs.

James Lee Witt, Director of the Federal Emergency Management Agency (FEMA) announced a new program called 'Project Impact: Building a Disaster Resistant Community' on November 6, 1997. The objective of this initiative is to encourage local communities to undertake actions that will protect families, businesses and the community by reducing the harmful effects of natural disasters. The emphasis of emergency management will change from responding to disasters to taking actions in advance of disaster that will reduce the potential damage. James Lee Witt went to Deerfield Beach, a small city in Florida, to launch this new initiative. He said, 'We have got to change the way we deal with disasters. We have to break the damage-repair, damage-repair cycle.' 'We need to have communities and businesses come together to reduce the costs and consequences of disasters.'

Deerfield Beach was the first city to sign an agreement with FEMA to become a 'disaster resistant' community. FEMA will provide up to $1 million in seed money for disaster resistant actions. Hurricanes are a major problem for the city and have caused tremendous damage in the past when the wind had blown roofs off, blown out windows and the driving rain ruined everything inside. For example, the city will now invest $150,000 of FEMA's money in putting hurricane straps on the auditorium and cafeteria of the local high school and installing extra strong wind shutters on all high school windows. These shutters are designed to withstand the severe winds which have in the past exceeded the wind speeds listed in the building codes. The high school will serve as a shelter for city residents whose homes have been demolished.

Local homeowners are being encouraged to protect their homes against hurricane storm damage. Home Depot, a building supply company with emphasis on supplying do-it-yourself folks, has established a display of hurricane-resistant structural improvements which homeowners should consider and has established training courses for local homeowners to teach them how they can protect their homes. They also sell the building materials and rent some tools, such as nail-guns.

FEMA's Basic Concepts

There are three basic concepts in FEMA'S initiative:

First - Mitigation is a local issue. There should be a partnership of local government, local businesses and local private citizens. Each community may face different hazards. The local organizations should examine their particular risks for natural disasters. The Federal government in Washington may be thousands of miles away and not understand the local situation.

Second - Private sector participation is essential. Disasters threaten the economic well-being of our communities. More than 250 businesses in Chesterfield, Missouri were affected by the mid-west floods of 1993; only 65 re-opened for business. Congress has become increasingly concerned that everyone seems to just sit back and wait for federal assistance and federal funding after a disaster. It is certainly in the best interest of the local private businesses to take appropriate cost-effective actions prior to a disaster in order to survive. The local residents need to resume living normal lives as soon as feasible after a disaster

Third - Mitigation is a long-term effort that requires long-term investment. All stakeholders must realize that this will be a worthwhile investment. Possible actions to reduce the harmful effects of disasters and to reduce the economic and social costs of recovery should be carefully examined so that appropriate measures can be agreed upon by all the participants.

According to FEMA, Arnold, Missouri received more than $2 million in federal disaster assistance after the 1993 Midwest floods. After the 1995 flood, a disaster resistant Arnold incurred damage less than $40,000 as a result of non-structural mitigation.

FEMA is taking a number of actions to get this program established all over the United States. There are seven pilot projects in different areas of the States to showcase the new activity. FEMA's goal is to have at least one disaster resistant community in each of the fifty states by the end of 1998.

FEMA's Project Impact Guidebook

One of FEMA's first actions was to issue a 'Project Impact Guidebook' which outlines how communities might start their own local project. FEMA suggests four steps:

1. Building Community Partnerships. Form a 'Disaster Resistant Community Planning Committee' with representatives of the local government, state and federal disaster agencies, local business, labor, and environmental organizations, and local citizens and homeowner associations.

2. Hazard Identification and Hazard Vulnerability.

The first tasks of the Planning Committee should be to identify the local community's risks for natural disasters and then to assess the community's vulnerability to these particular risks.

3. Identifying and Prioritizing Risk Reduction Actions in Your Community.

Based on the specific possible disasters to this local community and the estimated vulnerabilities, the community should explore possible mitigation and preparedness actions to reduce future damage and then establish priorities for these possible activities.

4. Communicating Project Impact to your Disaster Resistant Community.

The community must be educated to understand the importance of working together in a partnership to support the recommended mitigation actions. The local partnership must somehow work out how to raise local money for the most cost-effective actions and not just sit back and hope for Federal funding.

Community Partners

Who are 'community partners'? FEMA suggests comprehensive coverage of the local organizations and groups from the following major fields: government; industry & business; infrastructure; volunteer & community –based organizations; health care; workforce; and education. Some examples might be as follows:

Government: Government has the responsibility to protect the public health, safety, economic stability and growth of our community. Government representatives must play key roles in preparing our city to become more disaster resistant as well as providing emergency response and assistance, and helping in recovery.

Federal Emergency Management Agency (FEMA Region IX, San Francisco)

State Office of Emergency Services (OES Coastal Region, Oakland)
Monterey County Office of Emergency Services, Salinas
City of Pacific Grove including the Mayor and City Council members, the City Manager (and Emergency Program Manager), Police Chief; Fire Chief, Public Works Superintendent, Community Development Director and the Recreation Director.

Industry & Business: Businesses need to survive so that appropriate disaster resistant activities for rapid business resumption and recovery will naturally also help in the recovery efforts of the city's residents who are trying to get back to normal living. Businesses, therefore, have direct economic incentives for participating in disaster preparedness activities which will benefit them as well as helping their customers.

Infrastructure: The utility lifelines of electricity, natural gas, fresh drinking water, and sewer systems are critical to modern living. Loss or damage to these lifelines might cause critical problems for hospitals, businesses or homeowners. Transportation systems of roads, overpasses, bridges, and bus companies may be severely damaged in a big earthquake. Transportation systems are critical for our Police, Fire and Public Works departments to do their jobs.

Utilities: Pacific Gas & Electric (for electricity and natural gas); California-American Water Company; Pacific Bell Telephone Company; TCI Television Cable Company; Transportation: Monterey-Salinas Bus Company

Volunteer & Community –based Organizations: Volunteerism is alive and well in Pacific Grove. There are approximately 50 community —based organizations in our city and more than 400 in our Monterey county. Pacific Grove Churches -13 different denominations. Red Cross, Kiwanis, L i o n s Club, Rotary Club, Masonic Temple, Friends of the Pacific Grove Public Library, Friends of the Pacific Grove Museum of Natural History, American Association of Retired Persons, Neighborhood Associations, Environmental Groups, Pacific Grove Residents Association.

Health Care: Health care facilities should be in the partnership since it is essential that they be built or retrofitted to survive after disasters in order to provide immediate medical care for injured. After the 1989 Loma Prieta earthquake, the Watsonville hospital's emergency power system was damaged, the main buildings were moved by the earthquake so that vital water, steam, gas and electrical lines were damaged so that patients had to be evacuated and earthquake victims treated in the parking lot. A new

hospital to replace the damaged hospital was recently completed in 1998. Community Hospital of the Monterey Peninsula, Pacific Grove Convalescent Center, Canterbury Woods Retirement Home, Forest Hill Manor Retirement Home, Blind Center, Beacon House, Gateway Center.

Workforce: The people who work in a community should appreciate that their jobs and their lives may be changed and affected by disasters. All individual workers may be at risk if there is no electricity, the highways are damaged and transport of supplies in or out of the community is delayed, etc.

Education: Schools often provide facilities for Red Cross temporary shelters for disaster victims so that it is important that they participate in the partnership. Also, if the schools are damaged by the disaster, possible day care problems might be created for parents. Pacific Grove Unified School District; Pacific Grove Adult School; Pacific Grove Public Library; Pacific Grove Museum of Natural History; Pacific Grove Art Center.

Why should these groups be invited to become partners? It should be straightforward to point out that large-scale disasters such as earthquakes may pose problems for all of us. One should postulate a worst case earthquake scenario after which there may be no commercial electricity for weeks. Auckland, New Zealand recently had no electrical power for six weeks and there wasn't even a disaster! Water pipes, sewer lines and natural gas pipes may be broken in an earthquake. There may be no telephone service initially and cellular service may be so overloaded as to be essentially useless. Overpasses, bridges and highways may be damaged. Workers may not be able to come to work. There may be no supplies of gasoline for automobiles. Customers may not be able to come to downtown shopping areas and stores without emergency power sources may not be able to use electronic cash registers if there is no electricity. Each group may have their own agenda but we are becoming increasingly dependent upon each other.

In Deerfield Beach, Florida, the first pilot community, the original members of the partnership included Florida Power & Light, the Fort Lauderdale Sun Sentinel newspaper, Promus Hotel Corporation, State Farm Insurance and Home Depot. In Pascagoula, Mississippi, the Merchants & Marine Bank, Bell South, Mississippi Power Company, Pascagoula Port Authority, Jackson County Chamber of Commerce, City of Pascagoula and Ingalls Shipbuilding have joined together to help in disaster resistance

activities. In Wilmington, North Carolina, the City, New Hanover County Emergency Management, General Electric, Barnes & Noble Books, Lowe's Hardware Store, WGNI-FM radio station are partners.

In Oakland, California, the original partners included Chevron, EQE International, Washington Mutual Bank, FEMA Region IX, Oakland Municipal Chamber of Commerce, American Red Cross, Collaborating Agencies Responding to Disasters (CARD) — a nonprofit collaboration of 18 social service organizations in Oakland, Port of Oakland, Lakeshore Avenue Business Association, Sierra West Bank, Pacific Gas & Electric, Pacific Bell, East Bay Municipal Utility District, East Bay Habitat for Humanity, Mills College, Blue Cross of California, Alameda County Volunteer Center, Perralta Community College, U.S. Coast Guard, Christmas in April, and Catholic Schools Diocese of Oakland

In Seattle, the original partners were the Seattle City Council, Duwamish Peninsula Community Commission, INCA Engineer, Inc., International Conference of Building Officials, Jackson Place Community Council, Johnson Controls, King County Labor Council. KIRO Television. Master Builders Association, Phinney Neighborhood Association, Port of Seattle, Puget Sound Energy, Seafirst Bank, Shannon & Wilson, Inc., University of Washington, U.S. Geological Survey, Washington Mutual Bank, and Washington Volunteer Organizations Active in Disasters.

Hazard Identification And Hazard Vulnerability

The most frequently occurring natural hazards in the United States are floods, hurricanes, earthquakes, tornadoes and wild fires. Each local community can look at its history for the past two hundred years or so and determine which hazards have occurred. Then we need to identify which areas had been at the most risk. The situation is complicated because floods can cause mudslides, earthquakes can cause landslides, and wildfires which destroy vegetation can make hilly regions more prone to mudslides or landslides. FEMA suggests asking questions, such as: Where are floods most likely to occur? How strong are the winds that can affect us? Where are the earthquake fault zones located? Does the composition of the community's soil make it prone to landslides?

Oakland was selected to be one of the pilot disaster resistant communities because it has had a variety of disasters recently. For example, the1989 Loma Prieta earthquake, with epicenter more than 60 miles away, dropped a span of the Bay bridge from Oakland to San Francisco, damaged

many homes and caused the collapse of the upper level of an expressway trapping and crushing 42 cars. There was a fire in October 1991 in Oakland and Berkeley which killed 25 people, injured 150, and destroyed 3,354 homes. This was the worst urban fire in the United States.

The weather in recent years seems to have been getting worse as far as rainfall and consequent flooding is concerned. Most of the flood risk areas of the United States have now been mapped. There is a National Flood Insurance Program administered by FEMA and about 19,000 communities participate in this flood insurance program.

FEMA has developed a new computer program called HAZUS which has an earthquake loss model, flood hazard identification and a geographic information system. This program should be of help to communities in assessing their vulnerability to hazards and developing graphic methods to support decision making.

Identifying and Prioritizing Risk Reduction Actions

After a historical study of the types of hazards which Pacific Grove has experienced and an examination of the areas which might be vulnerable to this type of hazard, it would be desireable to examine a variety of measures which might be used to reduce potential damage in future disasters. One should review existing policies and regulations, including: Land use planning and regulation; Housing and building codes; Transportation planning; Conservation; Community growth planning.

FEMA's Guidebook contains some useful checklists of possible mitigation measures. There are a number of suggestions for the hazard of a hurricane, such as: install shutters on windows and doors, install additional hurricane straps and tie-downs to resist wind loads, reinforce existing un-reinforced masonry walls, provide emergency backup power to critical facilities, and when re-roofing a building, check and refasten the roof sheathing. For earthquakes: provide automatic earthquake-activated shut-off valves for gas lines, retrofit critical bridges and overpasses, check that houses are bolted to their foundations, add shearwalls to buildings, brace equipment such as emergency generators whose failure may disrupt operation of a critical facility such as a hospital, anchor expensive equipment such as computers to desks, brace parapet walls, and brace equipment which might topple over and block building exits.

Consider new approaches to correct ancient problems. For example, there is a wine growing region north of San Francisco in the Napa valley,

where the Napa River has caused tremendous flooding damage in past years. Rainstorms such as the 1998 'El Nino' when 64 inches of rain fell caused the voters of Napa County to go to the polls and vote to raise taxes to fix the problem. There have been 27 floods in the past 150 years despite an elaborate flood control system. The new approach will be to rip out the flood control system and allow the river to return to life and run wild for much of its 55 mile length. Under the new plan, some of the old levees built to confine the river in a straight channel, largely without success, would be lowered or removed. Bridges which block the flow of high water would be raised or torn down. People living in areas that regularly flood would be bought out so that they would move. These low-lying acres would be given back to the river as wetlands, so that water will go there when it floods — but nobody will live there. The new 'living river' approach will allow the river to widen during floods and fill the old marshlands. It is hoped that these restored wetlands will work as a sponge and reduce overall damage.

Since California is earthquake land, the partners of Oakland are exploring what cost-effective actions they should consider. The State Geologist has a forecast that, within the next 30 years, there may be a BIG earthquake of the size of the 1906 earthquake which wrecked San Francisco across the Bay. During the first year, Oakland will conduct and prepare an inventory of the City's housing/building stock. There are about 150,000 dwellings in Oakland.. There are many older wood frame houses, commercial buildings of un-reinforced masonry, or non-ductile concrete, or tilt-up construction. Cost-effective and feasible structural and non-structural activities for strengthening houses and buildings against hazards of earthquake, fire and severe weather will be investigated and developed. Also, the soil conditions are not good with large areas of fill which have 'liquidifaction' problems in earthquakes. There are many homes on hill slopes which have potential problems of landslides just in rainy weather, let alone earthquakes.

Seattle also is concerned with possible damage from earthquakes. They plan to create and implement a residential housing retrofitting program for builders, contractors and homeowners. They intend to improve the safety of schools by removing overhead hazards and investigating the advantages of installing automatic natural gas shut-off valves activated by the ground shaking of an earthquake. An earthquake mapping project will be conducted to show areas of Seattle where severe ground shaking might

be expected or liquefaction might occur in earthquakes. The harmful effects of too much rain will be considered by developing a set of computer-based hazard maps of possible landslide areas.

Communicating Project Impact To Your Community

At this stage, the community should have found interested participants to become partners in making the community more disaster resistant. The history of past disasters has identified the particular hazards, the geographical areas where damage occurred, and the types of structures most vulnerable. Studies of feasible and cost-effective approaches to make the community more resistant to disasters have been conducted and possible costs have been estimated in order to assist in making decisions as to priorities for carrying out the plan.

The stakeholders in this Project Impact enterprise must all agree on the overall scheme and the priorities in order to sort out the questions of raising the necessary funds and making the projects happen. Each partner should realize the advantages that will come with contributing their share and come forward with support. Public education and appropriate cooperation with the media are necessary. Journalists in the community should have been involved in this project from the beginning. They have a dual role, first, to inform the public of newsworthy events and public information before, during and after a disaster, and second, they are members of the business community.

Oakland plans to get the media heavily involved in spreading the word about progress on disaster resistant activities. For example, they will need help with publicizing their building strengthening education and training classes, and their proposed community 'tool lending' program. Also, during the first year they plan to have a pilot program in Oakland of at least 25 single-family houses and small business buildings with minor retrofit and non-structural hazard reduction completed as models for the community to inspect.

Oakland staged an event, 'Spring Break '98 — Students Outfit Oakland Homes' in April 1998 when 50 student-volunteers made non-structural earthquake retrofits for several hundred elderly or low-income Oakland residents. The students strapped hot water heaters to wall studs, bolted bookcases to walls, and educated residents as to precautions they might observe before and during a quake.

The FEMA Guidebook has numerous suggestions as to ways to communicate the potential advantages of disaster resistant communities to the public and the local participants. The media resources include newspapers (daily, weekly, monthly, college, and community), city and regional magazines, local trade and business publications, chamber of commerce newsletters, local radio and television stations, local cable stations, and now the Internet.

Institute For Business & Home Safety

The Institute for Business & Home Safety in Boston, Massachusetts is sponsoring a different private sector project, but one which has many of the same goals as FEMA's efforts to create disaster resistant communities. The Institute's project is called 'Showcase Communities.' The purpose of the Showcase Community program is to demonstrate the benefits of taking specific, creative steps within an entire community to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters. There are 67 insurance industry companies which are members of the Institute for Business & Home Safety.

The Showcase Communities program has three key objectives:

1. Help a community help itself by reducing its vulnerability to hurricanes, earthquakes, tornadoes, wildfires, floods or whatever natural disasters threaten it.
2. Generate a 'me too' attitude among other communities by showcasing the successful efforts of particular jurisdictions.
3. Learn what works and what does not work to reduce the emotional and financial devastation caused by natural disasters.

The Institute for Business & Home Safety has established 14 areas for participation in the program. Those criteria ask that the community:

1. Formally commit to participation by adopting a formal resolution to that effect
2. Adopt or agree to adopt the latest version of one of the model building codes as the minimum code and enforce it
3. Participate in the National Flood Insurance Program (NFIP) if in a floodplain and apply for/participate in the NFIP's Community Rating System
4. Receive a suitable Fire Suppression Rating System grade from the Insurance Services Office
5. Complete a risk assessment or agree to do so

6. Offer mitigation training to building design and construction professionals
7. Support IBHS and its partners in the non-structural retrofit of non-profit child care centers
8. Develop programs to increase the public awareness of natural hazards and ways to reduce or prevent damage
9. Incorporate natural hazard awareness and reduction programs into the school curriculum
10. Complete a land use plan that delineates the relevant hazards and incorporates them as factors in all land use decisions
11. Maintain emergency response and post-disaster recovery plans in place
12. Develop public sector incentives for mitigation to complement private sector financial incentives developed by IHBS and its partners
13. Develop inspection and certification procedures for incorporating mitigation into new construction and retrofit of existing buildings
14. Develop a Disaster Recovery Business Alliance

On January 8, 1998, the Institute for Business & Home Safety named Broward County/Deerfield Beach, Florida as the second pilot Showcase Community in its national disaster mitigation program. IBHS is selecting communities from around the country to participate in the program which will vividly demonstrate the benefits of a community-wide disaster reduction effort. Evansville, Indiana was the first pilot Showcase Community.

As a part of this program, the State Farm Insurance company is building a residential-style demonstration home which will incorporate more than 100 construction features designed for better protection and to reduce property loss in the event of a hurricane, water damage, fire or other disasters. Two full-time State Farm Insurance staff will conduct educational seminars and tours for building construction companies and the general public.

Sustainable Communities

The Department of Energy's Center of Excellence for Sustainable Development is involved in a related type of initiative. Its Center has an interesting summary on the Internet of activities in eleven U.S. communities: Cambridge, Massachusetts; Chattanooga, Tennessee; Jacksonville, Florida; Missoula, Montana; San Francisco, California; San Jose, California; Santa Monica, California; Seattle, Washington; Tucson, Arizona; and Willpa Bay Watershed, Washington.

Each community has an individual sustainability program tailored to fit local concerns, but there are many things in common. These programs were not initially instigated to solve programs associated with disasters, but naturally address them as relevant aspects of dealing with sustainability problems of quality of life, declining economy, public safety, education, natural environment, etc. For example, the Mayor and Council of the City of Tucson decided in 1996 to evaluate City projects and programs in light of three priorities: economic vitality, community stability, and healthy environment. A local ward forum process involving participation of 700 City residents came up with 17 themes which are being examined to identify community priorities which will be used to provide citizen input to the City's budget process and shape future programs and services. These themes are:

1. Viable and accessible alternatives to automobile transportation
2. Engaged community and responsive Governance
3. Safe neighborhoods
4. Caring, involved healthy families and youth
5. Excellent public education
6. Infill and reinvestment, not urban sprawl
7. Abundant urban green space and recreation areas
8. Protected natural desert environment
9. Better paying jobs
10. Clean air and quality water
11. People-oriented neighborhoods
12. Respected historic and cultural resources
13. Quality job training
14. Reduced poverty and equality of opportunity
15. Strong local businesses
16. Efficient use of natural resources
17. Successful downtown business district

Conclusion

It would seem desirable for us to continue to watch the progress being made in FEMA's seven pilot communities and to see whether some of their approaches may be appropriate for Pacific Grove's possible disasters. We can then explore the costs and benefits of some of these approaches.

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Disaster Preparedness for Children

Paper presented at Disaster Forum 2000 in Edmonton, Canada

DISASTER PREPAREDNESS FOR CHILDREN
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ABSTRACT

Disaster preparedness for children starts with disaster preparedness for parents. Parents are encouraged to come to our Fire Department for preparedness literature and to visit their local American Red Cross chapter and ask to see some of the extensive disaster educational materials. There are numerous pertinent publications and videos on earthquakes, hurricanes, fires, chemical emergencies, floods, tornadoes, heat waves, thunderstorms, and winter storms. The Federal Emergency Management Agency has cooperated with the Red Cross in the preparation of many of these publications. The Red Cross has brochures, videos, children's workbooks, instructor's manuals, posters, booklets, hurricane tracking charts, guides, and coloring books in English. Many of these are also available in Spanish, and other languages. Parents should read some of these publications and discuss disaster preparedness with their children.

The Pacific Grove Fire Department has a special program of disaster preparedness for children in our elementary schools. The program uses earthquakes and fires as illustrative examples for teaching kindergartners, first, and seconds graders the basic principles of disaster preparedness. The parents get involved because the fire department gives earthquake literature to the children to take home along with a letter asking the parents to read and discuss preparedness with their children. Earthquakes, for example, may be frightening for both children and adults, but being prepared both physically and mentally should help in reduction of fears.

A specially designed teaching tool is used for this disaster preparedness program. The Fire Department has an earthquake and fire safety trailer which it takes to an elementary school. The trailer looks like a two story House built to the scale of the height of an average six-year old child. A group of ten children, accompanied by a fireman instructor, go into the

downstairs living room and listen to a talk on earthquake safety in the home. They learn why bookcases and hot water heaters should be bolted to the wall studs, how to run and tell their mother if the fireplace screen were to fall over while there was a fire in the fireplace, etc. The children take turns practicing telephoning 9-1-1 to report a pretend emergency, actually, a second fireman instructor in the control room of the trailer answers and asks them the same questions a real 9-1-1 operator would ask.

In order to involve the parents, the children are given appropriate earthquake and fire safety literature to take home with a note asking the parents to read and discuss preparedness with them. The children also take home a letter inviting the parents to take a free six-week neighborhood emergency response team training program. This program teaches earthquake preparedness in the home, how to keep people injured in an earthquake from bleeding to death, firefighting and how to rescue earthquake victims.

Junior high school students may study science courses developed with National Science Foundation support which use disasters. For example, students study hurricanes as an introduction to meteorology. Senior high school students are invited to take neighborhood emergency response teams training along with their parents.

Introduction

Disaster preparedness for children starts with disaster preparedness for parents. Disaster preparedness for children also means disaster preparedness for older children who are role models, grandparents, and for the children's child-care providers. In addition, disaster preparedness for children means disaster preparedness for the children's teachers in schools. Perhaps someday children will learn all they ever need to know from the Internet, but until that day come along, we should plan on children learning initially from their mothers, fathers, grandparents, older brothers and sisters, and day-care providers until they begin school. Then there will be a twelve-year period when teachers at their schools try to impart knowledge and prepare children for living or more schooling. Consequently, to prepare children for disasters, we must first prepare the parents and then persuade parents to teach preparedness to their children as well as set good examples.

Disaster Preparedness For Earthquakes

California has experienced two earthquakes and a variety of other disasters such as floods and large fires during recent years. A system of disaster preparedness for earthquakes has evolved in Pacific Grove since earthquakes provide such a convenient scenario - no warning, damage to homes and business buildings, damage to streets and highways, no electricity, no telephone, no gas, no water, no sewer system, etc. An individual should consider disaster preparations he or she might do at home, at the office, and en route in a automobile. Next the individual might consider what disaster preparedness measures would be appropriate for his or her family and what to teach children to prepare them for disasters.

Disaster preparedness must start with individuals assuming more responsibility for their own preparedness and response. If and when a BIG earthquake occurs, the usual police, fire and public works departments will be overwhelmed. Ideally, each individual should consider what is feasible, prudent and cost-effective to do to prepare for disasters and include all family members, especially children, in this preparedness process.

The Role Of Parents In Teaching Young Children About Disasters

How should parents, grandparents, and child-care providers learn about disaster preparedness? One way would be for them to visit their local American Red Cross chapter and ask to see some disaster educational materials. There are numerous pertinent publications and videos on earthquakes, fires, chemical emergencies, floods, tornadoes, heat waves, hurricanes, thunderstorms, and winter storms. The Red Cross has prepared 99 different brochures, videos, children's workbooks, instructor's manuals, posters, booklets, hurricane tracking charts, guides, and coloring books in English. Many of these are also available in Spanish, Vietnamese, Korean, Mandarin, Cantonese, and Tagalog. The Federal Emergency Management Agency has cooperated in the preparation of many of these publications.

For example, some of these educational materials are:

Earthquake-Fire-Winter Storm (ARC 5017). Target audience: children age 5-8. Be Ready 1-2-3 Workbook which is an 8 page workbook that helps children learn about home fires, earthquakes, and winter storms through activities and demonstrations led by 'experts' Cool Cat (home fires), Ready Rabbit (winter storms) and Disaster Dog (earthquakes). There is an Instructor's Manual (ARC 5018) for parents, teachers and day-care

providers with lesson plans. There is also a 'How To' Guide (ARC 5019) which contains information on the supplies needed for each lesson.

Earthquake! Do Something! (ARC 4004). Target audience: Age 8 to adult. This is a13-minute video for parents to show to their children which reinforces family emergency planning, safety during an earthquake, and dealing with injuries and damage after an earthquake. Also available in Spanish, Vietnamese, Korean, Mandarin, Cantonese, and Tagalog.

Are You Ready for an Earthquake? (ARC 4455). Brochure for parents to discuss with their children which provides essential earthquake information and poses interactive questions, encouraging family disaster planning and preparedness.

Adventures of the Disaster Dudes (ARC 5024). Target audience: children age 8-12. Video-based program with a Presenter's Guide, and a 14-minute video. The video features children describing what a disaster really is, information on the correct response and how to create a family disaster plan.

Disaster Preparedness Coloring Book (ARC 2200). Target audience: children age 3-10. Coloring book for children and their parent or day-care provider to discuss disasters that can happen and ways to get ready for them.

Your Family Disaster Plan (ARC 4466). Brochure for parents to discuss with their children — the four steps to disaster safety: finding out what can happen; planning; preparing; and practicing.

Disaster Supplies Kit (ARC 4463). Brochure for parents to discuss with children which gives information on how to assemble a Disaster Supplies Kit and a checklist for items to place in it.

Family Disaster Plan/Supplies Kit Video (ARC 4498). Video for parents and children to watch which shows how to create a disaster plan (13 min) and a disaster supplies kit (8 min), why each is important, and which stresses individual and family preparedness measures.

Emergency Preparedness Checklist (ARC 4471). Brochure for parents to discuss with their children which helps families examine ways to prepare each household member and their home for disasters.

Helping Children Cope With Disaster. (ARC 4499). Brochure for parents, teachers, and day-care providers which gives information on helping children prrepare for and cope with disasters. Covers disaster preparedness activities in which children can join in, and how to help children recover

from and understand disaster.

Pets and Disaster: Get Prepared (Developed with the Humane Society of U.S. - 321355). Brochure for parents to discuss with their children which covers having a pet plan, suggested pet disaster supplies, what to do when a disaster threatens, and suggested alternatives since pets are not allowed in shelters.

Parents should read some of these publications and discuss possible scenarios with their children. Look at the videos together. Consider which types of disasters might occur in local area and what might be the prudent things to prepare for. A family plan should be developed with all participating. An out-of-state relative or friend should be selected and everyone given the telephone number to help in reuniting the family after a big disaster. All children should be shown how to dial 9-1-1, when to do so and told what kind of questions the operator will ask them. The whole family should participate in deciding what types of disaster supplies should be obtained and where they should be stored. Help the children memorize important family information such as family name, address, and phone number. Small children may need to carry a card with appropriate information.

If the children know something about the various types of disasters and what might happen, it will help prepare them for the possibility that they may need to sleep for a few nights in a Red Cross shelter or go camping or do something out of the ordinary because of the hurricane, flood or earthquake damage. Therefore, parents might well follow the advice given by the Red Cross:

1) Learn what hazards exist in your community and how to prepare for them.

2) Meet with the entire family to discuss what you would do in each situation and develop a family plan.

3) Take appropriate action with all family members participating to assemble an emergency supply kit for each, install smoke-detectors, select an out-of-state telephone contact, and give emergency telephone numbers to each family member.

4) Practice the family plan so that everyone will remember what to do when a disaster does occur.

Elementary School Programs

The elementary schools in Pacific Grove are fortunate. The State's Office of Emergency Services supports school programs on disaster

preparedness with which all teachers are involved. In addition, the Pacific Grove Fire Department has an Earthquake and Fire Safety trailer. This teaching tool can be brought to each school so that all the kindergartners, first and second graders can be taught appropriate earthquake and fire safety preparedness in conjunction with the teacher's own preparedness teaching projects. As a matter of fact, this trailer is not only for Pacific Grove schools. The Northern California Disaster Preparedness Network was given some of the American Red Cross money received in California for earthquake victims and earthquake preparedness after the 1989 Loma Prieta earthquake to disburse for worthwhile projects. The Pacific Grove Fire Department received its grant from the Tri-County, Monterey-San Benito-Santa Cruz, Disaster Preparedness Committee to obtain the teaching trailer for use by schools in all the cities of the three counties. For example there are twelve cities in Monterey County. All of the fire departments in the three counties were invited to send firemen to free train-the-trainer classes in Pacific Grove so that they could have qualified instructors to teach children in their home areas. The trailer has also been demonstrated at county fairs and other events to publicize its availability.

The trailer looks like a two-story house. It is a two-story house, but it is built to the scale of the height of an average six year old child — adults can crawl around inside on their hands and knees. A group of ten children, accompanied by a fireman instructor, go into the downstairs living room and listen to a talk on earthquake safety in the home. They learn why bookcases and hot water heaters should be bolted to wall studs, how to run and tell their mother if the fireplace screen were to fall over while there was a fire in the fireplace, etc. The children take turns practicing telephoning 9-1-1 to report a pretend emergency. Actually, a second fireman instructor in the trailer's control room answers the phone and asks them the same questions a real 9-1-1 operator would ask.

After the children are upstairs on the second floor in a bedroom, the instructor asks one of the children to get in bed and pretend to be asleep. Then the control room fireman simulates a fire in the bedroom by releasing dense (theatrical, non-toxic) smoke which activates a smoke detector alarm. The child is taught to roll out of bed and crawl to a door — 'Never stand up and run!.' They are also taught 'Never open a door without feeling it!' — to find out if it is hot because of fire on the other side of the door. The control room fireman can make the door hot so that the children learn not

to open it and then must find an alternate way out of the bedroom. In fact they crawl to a window which opens on to a balcony where there happens to be a safety ladder down to the ground from the second floor.

The children are given coloring books with earthquake safety cartoons and other appropriate earthquake and fire safety literature to take home. The Fire Department also asks each child to take home a special letter to the parents asking them to read this material to the children and discuss preparedness principles with them. In addition, the brochure 'Helping Children Cope with Disaster' booklet which is a joint Federal Emergency Management Agency/American Red Cross effort is sent along. The Fire Department's letter which the children take home also invites the parents to sign up for a free six-week neighborhood emergency response team training program. This program teaches earthquake preparedness in the home, how to keep people from bleeding to death, how to use home fire extinguishers and how to rescue people trapped under earthquake rubble.

Junior High School Years.

A science teacher in Montgomery County, Maryland about ten years ago submitted a proposal to the National Science Foundation requesting support to develop a series of event-based science books. Dr. Russell G. Wright felt that junior high school students could be motivated to learn about science by studying real-life disasters. For example, they would study geology by starting to learn something about volcanos, study earthscience by learning about earthquakes, and study meteorology by learning about hurricanes and tornadoes, etc.

The National Science Foundation provided a million dollars to support the development of a series of ten modules. Each begins with media coverage (video and print) of an event such as the Exxon Valdez oil spill, the Great Flood of 1993, or Hurricane Andrew. Students explore their own knowledge, preconceptions, and questions before tackling a real-world, interdisciplinary task that flows from that event. Open-ended, hands-on activities help students develop knowledge and science skills. Students experience the role science plays in the lives of ordinary people. There are Student Edition workbooks and Teacher's Guides which include student activity pages, teaching suggestions, and one or more videos. Classroom Sets contain a Teacher's Guide with video(s) and 15 Student Editions. These publications are available from Dale Seymour Publications, (800) 872-1100, fax (800) 551-7637.

Senior High School Years.

Senior high school students are role models for younger children. They are invited to attend classes in disaster preparedness which were originally designed for adults. These classes have different names in different locations. A common name is community emergency response teams (CERT) which is now the term used by FEMA at the Emergency Management Institute, Emmitsburg, Maryland. Originally, the Los Angeles Fire developed a program to teach disaster preparedness to citizens. Later the San Francisco Fire Department decided to approach neighborhood associations to train neighborhood emergency response teams (NERT). The reason is that the Fire, Police and Public Works Departments will probably be overwhelmed in any large scale disaster. There may not be enough fire engines to try to put out numerous simultaneous fires or rescue disaster victims trapped under earthquake rubble. Many cities in California now have training programs for neighborhood emergency response teams. In my city of Pacific Grove, we call our program 'Volunteers in Preparedness.' The program consists of six classes:

Class #1 Earthquake Preparedness in the Home – Appropriate earthquake preparedness actions you might consider for the home, work-place and car. Is the house bolted to the foundation? Is the hot-water tank strapped to wall studs? Are all tall bookcases bolted to the wall? Are computers and high value items such as TVs anchored to desks or tables with earthquake strapping so that they won't walk off and fall on the floor? Is the encyclopedia on the bottom shelf of the bookcase? Do you have water, food, clothing, and emergency supplies for three days if an earthquake were to damage your home and you had to sort of camp out until temporary Red Cross shelters were set up?

Class #2 Utility Control, and Hazardous Materials – Do you know where your natural gas meter is located? Do you know when and how to turn the gas off? For example, if an earthquake were to break gas pipes inside your house and you smelled the gas, then you turn the gas off. Do you know how to turn off the electricity and water? Are your household chemicals stored properly in your home so that they will not become hazardous chemicals if the containers break in an earthquake?

Class #3 Disaster Medicine –This disaster medicine class teaches triage –sorting of injured victims into categories of: 'immediate', when rapid treatment is imperative because of life threatening injuries, 'delayed' when

injuries are not life threatening, and 'dead' where nothing can be done for this victim. The emphasis is on initial life savings procedures — how to keep victims from bleed to death, how to keep victims breathing, and how to keep victims from going into shock. (All students are encouraged to take the American Red Cross Standard First Aid Course. The Community Hospital of the Monterey Peninsula schedules this eight-hour course once each month.)

Class #4 Search and Rescue — This class covers possible earthquake damage to different types of construction of houses, apartments and buildings. How to recognize earthquake damage. How to search and rescue missing neighbors who may be trapped inside a damaged house. How to lift and carry injured neighbors.

Class #5 Volunteers in Preparedness Team Management and Amateur Radio — In large cities such as San Francisco, the San Francisco Fire Department has a formal organization of neighborhood emergency response teams. Teams have staging and assembly areas, perhaps at elementary school playgrounds, and each team reports to one of eleven Fire Department district centers. In our city, population 17,000, we have a less formal organization of neighborhood teams. We have enlisted the cooperation of FCC-licensed amateur radio operators who live at various locations scattered throughout the city. Our earthquake scenarios always assume that there will be no commercial electricity and no telephone system working after an earthquake. Each VIP team makes contact with a 'ham' who lives a block or two away to send information status reports by their battery-operated amateur radio gear to the City's emergency operations center where the City Manager, Police and Fire Chiefs, etc are operating.

Class #6 Fire Fighting Training With Fire Extinguishers And Rescue Operations — Each student volunteer is taught basic principles of fire fighting and how to use fire extinguishers. Each volunteer practices putting out one or two fires so that they are comfortable doing this quickly in the dark if they need to in their own home. The volunteers learn how to rescue a neighbor who is trapped underneath earthquake rubble. They learn how to build earthquake cribbing to safely lift the rubble and extricate the victim.

In our city, the cost of materials for each student is $30 for hard hat, identification vest, and firefighting materials expense. In some other cities, the Fire Department includes training expenses for the neighborhood emergency response teams in their annual budget.

Training For Parents

In keeping with our theme that 'Disaster preparedness for children really means disaster preparedness for parents', we take advantage of the City's exercises to both train the parents and call attention to earthquake preparedness for all residents of the city. The State of California's annual earthquake exercise is used for training of city employees and non-governmental organizations such as the Red Cross and Salvation Army. It is also used for general public education in earthquake preparedness and training of those parents involved in neighborhood emergency response teams. The State has an annual statewide earthquake exercise usually scheduled for the first Tuesday of April each year. For example the announcement for the 1996 exercise in the City of Pacific Grove was as follows:

Statewide Earthquake Exercise, 10:30 a.m., April 2, 1996

1. The City of Pacific Grove will participate in the State of California's earthquake exercise scheduled for Tuesday, April 2,1996. The City's emergency operations center will be activated at 10:00 a.m. at the Community Center, 515 Junipero Avenue.

2. The exercise will proceed in the context of a 'BIG' earthquake. It will be assumed that the following conditions will prevail after 10:30 a.m.: No electrical power, No gas, No telephone service and cellular service is overloaded, No drinking water, No sewer system. Earthquake damage to local highways, bridges over the Salinas River, overpasses and underpasses on Routes #1 and #68 has resulted in access problems. Earthquake damage to PG&E power generating stations at Moss Landing and other locations, switching facilities and transmission lines has resulted in a lack of electrical power for Pacific Grove (scenario assumption - loss of power for one week. Earthquake damage to telephone switching facilities and telephone lines has resulted in an initial lack of regular telephone service. Scenario assumption - no telephone service of any kind for one week. Earthquake damage to water, sewer, and gas pipe lines has been widespread in Pacific Grove scenario assumption - no resumption of services for two weeks. Earthquake damage to un-reinforced masonry structures has been extensive. Earthquake damage to housing has resulted in approximately 17% Kobe, Japan experience of the population of Pacific Grove displaced from their homes and 10% of these requiring temporary shelter and feeding, scenario assumption - Residents needing shelter 274. Earthquake damage has resulted in 35% of the population Kobe

experience in Pacific Grove dead, and 2.34% injured Kobe experience who require first aid and/or hospitalization, scenario assumption - Dead: 57, Injured: 377.

3. Preliminary planning for the exercise includes the following events:

10:00 a.m. Activation of the City's emergency operations center at the Community Center, 515 Junipero Avenue, based upon an earthquake prediction message received from the State OES.

10:30 a.m. Earthquake!

The City of Pacific Grove's Damage Assessment Team may be activated under the direction of the Chief Building Inspector and begin damage assessment surveys.

The following organizations may conduct an earthquake evacuation exercise after the 10:30 a.m. earthquake: Hopkins Marine Station, Stanford University and Monarch Pines

The Monterey County Chapter American Red Cross in Salinas will send a shelter management team and an emergency response vehicle (complete with amateur radio station) to Pacific Grove. The team has a Red Cross trailer which contains cots, blankets and comfort kits. Monterey County Red Cross may need to request mutual aid assistance from the cluster of nearby Red Cross chapters, such as Carmel-by-the-Sea and Santa Cruz.

The Monterey Bay Search Dogs, Inc. will be requested to provide urban rescue search dogs to find survivors buried alive in (pretend) earthquake rubble of collapsed buildings. The search operation will be conducted at the City's Corporation Yard, 2100 Sunset Drive at 11:00 am.

Radio station KOCN will set up a portable remote facility at the emergency operations center so that the Mayor and City Council members can make live broadcasts to residents of Pacific Grove.

Pacific Grove amateur radio operators will set up an amateur radio station at the emergency operations center.

The Salvation Army will activate its headquarters amateur radio station in Salinas and send its emergency canteen vehicle over to Pacific Grove to provide coffee and lunch to disaster workers at the emergency operations center.

Troop 90, Pacific Grove Boy Scouts will provide scouts for duty as pages at the EOC to deliver messages, run errands, escort visitors and assist with security.

The Volunteers in Preparedness (VIP) neighborhood emergency response teams who are registered disaster service workers will be activated in their

respective neighborhoods. These teams, assisted by assigned Boy Scouts and amateur radio operators, will collect preliminary damage information in their neighborhoods and report by amateur radio to the EOC. The VIP teams will conduct search & rescue operations in their neighborhoods as well as provide emergency utility control, disaster medical attention and assistance to earthquake victims.

Conclusions

A comprehensive public education program aimed at parents, grandparents, child-care providers, and teachers has been developed to teach them basic concepts of disaster preparedness so that children of all ages can be informed about possible natural hazards which might occur in their local neighborhoods. If the children understand something about these hazards, and participate in preparedness planning to obtain emergency supply kits of food, water, and first-aid supplies, it is hoped that they will be better prepared if these disasters ever occur.

References & Resource Materials

American Red Cross Disaster Educational Materials http://www.redcross.org/disaster/safety/list.html

Federal Emergency Management Agency .(1990). Earthquake Safety: Activities for Children, (FEMA 88a/March 1990). Washington: FEMA

Masoff, Joy. (1998). Fire! New York: Scholastic,Inc., (ISBN 0590-97872-1)

Wright, Russell G. (1995). Event-Based Science series. (Note: SE are Student Edition workbooks and TG are Teacher's Guides which include one or more videos. These publications are available from Dale Seymour Publications, (800) 872-1100, fax (800) 551-7637)

Earthquake! Investigations in earth science. TS30438 SE; TS30454 TG

Volcano! Investigations in geology TS30682 SE; TS30683 TG

Tornado! Investigations in meteorology. TS36868 SE; TS36869 TG

Gold Rush! Investigations in mineralogy. TS30678 SE; TS30679 T

Flood! Investigations in stream dynamics. TS30607 SE; TS30608 TG

Hurricane! Investigations in meteorology. TS30439 SE; TS30462 TG

Oil Spill! Investigations in oceanography. TS30440 SE; TS30463 TG

Toxic Leak! Investigations in groundwater. TS30603 SE; TS30604 TG

Asteroid! Investigations in astronomy. TS30605

Terrorism and School Violence

Paper presented at Disaster Forum 2001, Calgary, Canada

TERRORISM AND SCHOOL VIOLENCE
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ABSTRACT

How well are schools prepared for potential acts of terrorism and school violence? School administrators are responsible for the safety of their students and staff in any disaster, whether it be a fire, an earthquake, an act of terrorism, or a school violence incident. Emergency managers should help schools take prudent measures to prepare for all possible disasters. Schools should develop emergency plans, train staff in emergency response procedures, and conduct exercises to practice using their plan. In any disaster, local police, fire, and emergency medical units rescue the injured, put out fires, and do whatever is necessary to save lives and protect property. In the event of an act of terrorism or a school violence incident, these local authorities are initially in charge of rescuing the injured and performing their usual life and property saving functions, but when FBI agents arrive on scene, the FBI takes over management of crime scene aspects. Information on various types of school violence and possible acts of terrorism should be of value to first responders and to schools in strengthening their disaster planning, disaster preparedness, and increasing security and response measures.

Weapons of Mass Destruction

The FBI considers terrorists to be criminals, reference (1). The FBI defines terrorism as, 'the unlawful use of force or violence against persons or property to intimidate or coerce a Government, the civilian population, or any segment thereof, in furtherance of political or social objectives.'

The FBI is the lead Federal Agency in the crisis response involving a Weapon of Mass Destruction. The definition of Weapon of Mass Destruction is 'Any weapon designed or intended to:

1. Cause death or serious bodily injury through the release, dissemination, or impact of toxic/poisonous chemical or their precursors.

2. Release radiation or radioactivity at a level dangerous to human life.
3. Any weapon involving a disease organism.
4. An explosive (greater than 4 ounces), incendiary, poison gas, bomb, grenade, or rocket.

Statistics of Bombing

The Bureau of Alcohol, Tobacco and Firearms of the Treasury Department compiles national statistics on criminal use of explosives. In 1996, for example, there were 1,457 bombings, 504 attempted bombings, 427 incendiary bombings, and 185 attempted incendiary bombings for a total of 2,573 bombings, reference (2). Data for the years 1992 through 1996 shows that during this 5-year period, there was a grand total of 14,282 bombing, with 322 people killed and 3,060 injured.

The targets of these bombing attacks are listed in reference (3). About 5 % (661) of the grand total of 14,282 bombings for the 5-year period were targeted against educational facilities.

The motives which were determined for 8,348 bombings of the grand total of 14,282 bombings are given in reference (4). Vandalism is at the top of the list with 5,461 bombing incidents. Revenge was next with 2,325 bombings.

Juvenile bombing incidents comprised 4,631 of the grand total of 14,282 bombing incidents for this 5-year period, 1992-1996 as shown in reference (5). Eighteen people were killed and 446 injured by juvenile bombings of the grand total of 322 killed and 3,060 injured.

Data for 1997 for the various states shows that California had more bombings than any other state. Reference (6), which presents the number of explosive incidents by state, lists California in number 1 rank with a total of 771 explosive incidents in the year 1997. Illinois had 304 and Florida had 301 explosive incidents. This data is derived from current National Repository data provided by the Bureau of Alcohol, Tobacco and Firearms' AEXIS 2000 and the Federal Bureau of Investigation's Bomb Data Center systems.

During the year of 1997, there was a national total of 2,217 bombing incidents. According to reference (7), 'Total number of Bombing Incidents by Target Type', 5% (107) were against educational facilities, consisting of 12 college/university incidents and 95 school bombings. Reference (8) on fatalities shows zero killed but 1 injury in college bombings and 17 injured in school bombings of the total of 31 killed and 211 injured in 1997. Data

on motives in reference (9) indicates that vandalism was the principal motive for incidents using explosives, with revenge next with 137 of the total of 1,685 of explosive incidents.

Arson

The Arson Statistics Report published by the Bureau of Fire, Tobacco and Firearms, reference (10) shows that ATF conducted arson investigations for 3,336 fires in the 5-year period from 1993-1997. There were 383 people killed in these fires and 921 injured.

Church Arson

A special report on church arson, the third report of the federal government's National Church Arson Task Force, reference (11), stated that there have been 827 investigations of arsons, bombing, or attempted bombing that have occurred at houses of worship between January 1995 and October 1999. The result has been the arrest of 364 suspects in connection with 294 of the investigations - an arrest rate of 35 percent - more than double the arrest rate of 16 percent of arsons in general. There have been 287 arsonists convicted by federal, state, and local prosecutors in the trials of 206 of these 294 church arson or bombing investigations.

Abortion Clinic Violence

Since 1982 there have been 169 arsons and/or bombings of abortion clinics, reference (12). Seventy-seven of these incidents have been solved, resulting either in arrests, convictions, indictments, and/or incarceration in prison facilities or State mental institutions. Until the passage of the 'Freedom of Access to Clinic Entrances' Act of 1994, these types of crimes were not under the jurisdiction of Federal agencies. Now, the Attorney General has designated a task force comprised of ATF, the FBI, the U.S. Marshalls Service and the Department of Justice to target any person or group who would jeopardize the lives and property of others and violate Federal arson and explosives laws.

Increasing Activity in Biological Terrorism

Some extremists discovered that biological agents were the poor man's weapon of choice. There have been a number of incidents using these agents, reference (13). Some of these incidents were:

1984: The Rajneesh used salmonella to try to poison people eating in a restaurant in rural Oregon in an effort to make some voters sick so that the Rajneesh could win an election.
1991: The Minnesota Patriots Council were making ricin, a potent toxin, for use against rural law enforcement officers.
1995: An extremist named Thomas Lavy was arrested in rural Arkansas for brewing up a significant amount of ricin.
1996: Thomas Leahy in Janesville, Wisconsin produced ricin and was attempting to produce botulinum.
1997: A petri dish marked 'anthracis' was delivered to the B'nai B'rith (Jewish Service organization) office in Washington, D.C. The dish was actually a harmless bacteria closely related to anthrax. The response involved closing off two blocks of the downtown area and decontamination of dozens of people.
1998 – July: Three men were arrested in rural Texas for conspiring to use several biological agents in a bizarre scheme against IRS and law enforcement personnel.
1998 – February: Larry Wayne Harris, a former member of the Aryan Nation, a white supremacist organization was arrested in Las Vegas, Nevada with several bags of a substance marked 'anthrax.' He was released when the substance was determined to be a harmless form of anthrax.
1998 – June: Three men were arrested in Olmito, Texas for threatening to kill federal agents and state officials with biological agents. They claimed to represent the Republic of Texas, a militant organization which claims sovereignty over Texas.
1998 – August: A white powder was spread through several floors of the Finney State Office Building in Wichita, Kansas. A letter at the scene falsely claimed the powder was anthrax. A letter sent by a white supremacist 'Christian identity' group calling itself the Brothers of Freedom of Americans to a local television claimed responsibility.
1999: Numerous letters containing a white powder, labeled 'anthrax' were sent to abortion clincs and various other organizations. Initially, the response included securing the building and decontaminating all people who had come in contact with the letter while the powder was sent by air courier to the FBI Terrorism Lab in Quantico, Virginia. After analysis, these were all determined to be hoaxes.

School Violence

Californians probably remember the bizarre kidnapping of school children on July 15, 1976, reference (14). A school bus with 26 children was taking children home from the Dairyland Union School, Chowchilla, California. Three men wearing masks and waving guns made the driver stop the bus. The driver and children were herded into two vans while the gunmen hid the bus in a bamboo thicket in a dry gulch. The gunmen then drove for eleven hours to an abandoned quarry where they forced the children and the bus driver into an old moving van buried six feet underground. The bus driver with help from the seven oldest boys somehow managed to get the children out to safety after sixteen hours of effort. The three young gunmen who lived in Portola Valley had drafted a ransom note demanding $5 million for return of the children.

More recently, the nation was stunned when two students killed a teacher and 12 students, and wounded 23 other students at Columbine High School in Littleton, Colorado on April 20, 1999, reference (15). Two boys, one 18 and the other 17 years old had apparently plotted for a year to kill at least 500 students and blow up their high school. They killed themselves at the scene.

The shocking thing was that this was not an isolated incident. There have been 15 other school shooting incidents which received publicity between 1996 and 2000. Some of these were:

Feb. 2, 1996 Moses Lake, Wash. 2 students and 1 teacher killed, 1 other wounded when 14-year-old Barry Loukaitis opened fire on his algebra class.

Feb. 19, 1997 Bethel, Alaska. Principal and 1 student killed, 2 others wounded by Evan Ramsey, 16, at his high school.

Oct. 1, 1997 Pearl, Miss. 2 students killed and 7 wounded by a 16-year-old who was also accused of killing his mother.

Dec. 1, 1997 West Paducah, Ky. 3 students killed, 5 wounded by a 14-year-old boy as they participated in a prayer circle at Heath High School.

March 24, 1998 Jonesboro, Arkansas. 4 students and 1 teacher killed, 10 others wounded outside as Westside Middle School emptied during a false fire alarm. Mitchell Johnson, 13, and Andrew Golden, 11, shot at their classmates and teachers from the woods.

April 28, 1999 Taber, Alberta, Canada. 1 student was killed and 1 student was wounded at W. R. Myers High School in the first fatal high school

shooting in Canada in 20 years.

Dec. 6, 1999 Fort Gibson, Oklahoma. 4 students wounded and 1 severely bruised in the chaos as a 13-year-old boy opened fire with a 9mm semiautomatic handgun at Fort Gibson Middle School.

Feb. 29, 2000 Mount Morris Township, Michigan. 1 six-year-old girl was shot and killed at Buell Elementary School near Flint, Mich. The assailant was identified as a six-year-old boy with a .32-caliber handgun.

Terrorist Bombing Incidents at Universities

There were 7 terrorist bombing attacks at universities in the United States between 1978 and 1993 included in the 17 year bombing spree of the 'Unabomber', reference (16). He had other targets as well and his explosive devices killed a total of three people and injured 23. The dates of the university attacks were as follows: May 26, 1978 at Northwestern; May 9, 1979 at Northwestern; October 8, 1981 at University of Utah; May 5, 1982 at Vanderbilt; July 2, 1982 at University of California, Berkeley; May 15, 1985 at University of California, Berkeley; and June 24, 1993 at Yale.

Arson Incidents at Universities

There have been many arson incidents at universities. The U.S. Department of Justice's report 'Crime in the United States 1996' had a tabulation of UCR Part 1 Crimes which included arson. The University of Colorado's Police Department examined these statistics and published a comparison with other universities on the Internet, reference (17). The University of Colorado had 8 arson cases in 1996, Colorado State had 13, University of California, Berkeley had 3, Iowa State had 1, University of Missouri, Columbia had 4, University of Nebraska had 0, University of Okalahoma had 1, Oklahoma State had 1,Baylor had 0, Texas A&M had 2, Texas Tech, Lubbock had 1, and University of Texas, Austin had 0.

Domestic Terrorists

The bombing of the Alfred P. Murrah Federal Building in Oklahoma City on April 19, 1995 was a shock to most people living in the United States. We had read about the bombing of the World Trade Center in New York city on February 26, 1993 in newspapers and seen it on television, but many of us believed that terrorists were always from Libya or somewhere like that and that Americans would not do that sort of thing. Oklahoma City changed all that. We began to realize that there were many different types of 'home-

grown' domestic terrorists and extremists. We found that there were anti-abortion groups, animal rights groups, militia groups, white supremacists, neo-nazi groups, tax protesters, arsonists, patriots, Klu Klux Klan groups, environmental groups, anti-World Trade Groups, etc.

Counterterrorism

Since there may be possibilities of acts of terrorism in our schools and universities as these statistics indicate, what should be done to prepare for these incidents? The Federal Government is taking a number of actions in various agencies to prepare these agencies to assist state and local governments. The Attorney General established a National Domestic Preparedness Office in October 1998, which Congress approved in November 1999. There is a helpful Internet site, reference (18). The Defense Department has been conducting training programs in 120 metropolitan areas to prepare the local police, fire, and emergency medical agencies to operate in incidents involving terrorist use of Weapons of Mass Destruction. There are national programs to establish Metropolitan Medical Assistance Systems which can rush to a scene to help local hospitals and ambulance units cope with decontaminating large numbers of casualties. Some local Police, fire departments, and hazardous materials organizations are obtaining special equipment and training to prepare for Weapons of Mass Destruction.

Schools should decide what prudent and cost-effective actions they might take to prepare for terrorism as well as all other disasters likely to occur in their geographic location, such as hurricanes, floods, tornadoes, earthquakes, ice storms, etc.

Disaster Preparedness

The Katz Act of the California Education Code, reference (19) requires that schools plan for earthquakes and other emergencies. The law requires schools to do the following:

1. Develop a disaster plan which includes emergency roles, responsibilities, and procedures for students and staff (both certificated and classified).
2. Conducted periodic drills, evacuation exercises, and other emergency response activities.
3. Provide appropriate training for staff and students.
4. Be prepared to have school buildings used as Red Cross shelters by the local community after disasters.

5. Take mitigation measures now to ensure the safety of students and staff in future disasters.

School Emergency Response: Using SEMS at Districts and Sites, is an excellent guide for schools for disaster preparedness.

State of Georgia Legislation

It may be of interest to note that the State of Georgia passed Senate Bill 74 effective July 1999, which required all schools to prepare school safety plans, reference (21). Article 27 of Chapter 2 of Title 20 was amended to insert a new Code Section 20-2-1185 in the Official Code of Georgia. The major features of this bill were:

(a) Every public school shall prepare a school safety plan to help curb the growing incidence of violence in schools, to respond effectively to such incidents, and to provide a safe learning environment for Georgia's children, teachers, and other school personnel. Such plan shall also address preparedness for natural disasters, hazardous materials or radiological accidents, acts of violence, and acts of terrorism. School safety plans of public schools shall be prepared with input from students enrolled in that school, parents or legal guardians of such students, teachers in that school, community leaders, other school employees and school district employees, and local law enforcement, fire service, public safety, and emergency management agencies. Such plans shall be reviewed, and if necessary updated annually. Such plans of public schools shall be submitted to the local emergency management agency.

(b) A public school may request funding assistance from the state for the installation of safety equipment including, but not limited to video surveillance cameras, metal detectors, and other similar security devices. Funding may be provided to a public school in accordance with a school safety plan prepared by the school and approved by the local board of education, the Department of Education, and the Georgia Emergency Management Agency.

(c) School safety plans prepared by public schools shall address security issues in school safety zones as defined in paragraph (1) of subsection (a) of Code Section 16-11-127.1. School safety plans should also address security issues involving the transportation of pupils to and from school and school functions when such transportation is furnished by the school or school system and school functions are held during non-instructional hours.

(d) The Georgia Emergency Management Agency shall provide training and technical assistance to public school system, and may provide this same training and technical assistance to private school systems, and independent private schools throughout this state in the area of emergency management and safe school operations. This training and technical assistance shall include, but not be limited to, crisis response team development, site surveys and safety audits, crisis management planning, exercise design, safe school planning, emergency operations planning, search and seizure, bomb threat management, and model school safety plans.

Emergency Response of Schools in California

The Petris Bill of the California Government Code reference (22) requires that all school districts respond to emergencies use the Standardized Emergency Management System (SEMS). This means that all plans must now incorporate SEMS procedures, all school personnel must be trained in how SEMS works, and exercises must be conducted to ensure that everyone knows how to use SEMS. This standardized emergency management system was developed after a disastrous fire in Oakland and Berkeley in 1991 when more than 3000 homes burned. The new system was introduced in 1996 after all state employees were trained. The standardized training means that all law enforcement personnel, including California Highway Patrol officers, county deputy sheriffs, State fish and game wardens, and city police receive the same training as firefighters and public works personnel. SEMS requires that each organization understands and uses the following:

1. The Incident Command System - a method of organizing emergency response effort into five functions: command; operations; planning/ intelligence; logistics; and finance/administration.
2. An Emergency Operations Center (or Incident Command Post in the field) with staff organized according to the same five Incident Command System functions.
3. Coordination of the school district's Emergency Operations Center with other Emergency Operations Centers of the Operational Area (County), City, and County's Office of Education, as appropriate.
4. Incorporation of the Standardized Emergency Management System into all school plans, training, exercises, and response during actual disasters.
5. Documentation of the use of SEMS in planning, training, exercising, and

during actual disasters.

Conclusions

First, schools and universities should include terrorist attacks in their emergency planning, so that all of the personnel who have emergency responsibilities in a disaster are aware of their roles in this type of event. All administrators should review their disaster planning to insure that they have a plan which is appropriate both for their location and local conditions and also includes terrorism aspects. What are the local natural hazards — hurricanes, floods, earthquakes, or whatever? Weapons of mass destruction, cyber-terrorism, arson and bombs should also be considered. What are the cost-effective actions which might be taken now to reduce potential damage in the future from natural hazards and terrorism. Planning for terrorism incidents should also address other complicating issues. A terrorist incident with a nerve gas may suddenly have people collapsing, so that the first responder need to have personal protection. There also may be a possibility of a secondary explosive device rigged to injure the first responders who arrive to rescue the original victims.

Second, school and university security administrators should talk to the local fire, police and emergency management agency and ask them to come and inspect their facilities. The police may have suggestions as to what might be done such as roving patrols to increase campus security at night to deter arson, installing burglar alarms in science laboratories and computer labs, installing motion-sensing lighting outside buildings, etc.

Third, the campus administrators should contact the FBI and discuss their concerns. Talk to the nearest FBI office and find out what the FBI would like the administrators to do. For example, the FBI needs to be notified as soon as possible and needs local help to preserve the 'crime scene' until they get there. As a matter of fact, disaster plans and training might include procedures to be followed concerning telephone bomb threats such as put out by the University of California, Davis, reference (23). It is suggested that, 'When a bomb threat is received over the telephone, the person taking the message should keep the caller talking as long as possible and make written notes of the following: the time and date of the call; the assumed age and sex of the caller; any distinguishing speech characteristics; what was said by the caller as precisely and completely as possible; any background noise that may help identify the source of the call; and the phone number of the caller (if your phone is equipped with this function).

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Disaster Information Networks

Paper presented at the International Conference on Information Systems for Disaster Management May 11-14, 1999 Mexico City Plenary Session 3 (May 13, 9:00-10:30), How a GDIN might Engage or Help Local Communities, especially those with poor communication capabilities.

ROLE OF LOCAL COMMUNITIES IN DISASTER INFORMATION NETWORKS

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ABSTRACT

Local communities need disaster information, such as alerting of oncoming tsunamis or warning of out of control forest fires which are approaching urban areas. The Global Disaster Information Network may be able to help local communities by coordinating disaster information from a variety of sources and making it available to those communities which might be affected. Also, local communities can provide detailed information as to their damage after a disaster in order to make the shipment of humanitarian relief supplies more timely and effective. Some of the organizations which are involved in this initiative and their activities will be reviewed. In particular, organizational and procedural improvements in management of disasters and disaster information in California will be examined to determine whether or not some of these approaches might be appropriate to the development of the Global Disaster Information Network.

Introduction

The Global Disaster Information Network has a tremendous potential for improving the capabilities of local communities to cope with disasters. GDIN should promote more effective collaboration among the providers, disseminators, and users of disaster information by complementing existing networks for sharing disaster information such as ReliefWeb. Some

developments in management of disaster information by the State of California may be pertinent to the evolution of the GDIN concept.

The 'Loma Prieta' earthquake at 5:04 p.m. on October 17, 1989 near Santa Cruz, California resulted in 63 people killed, 3,757 injured, 1,018 homes destroyed, 23,408 homes damaged, and 3,530 businesses damaged.. There was extensive damage to the business districts, homes, and hospitals in the city of Santa Cruz, and in nearby Watsonville, the other city in Santa Cruz County. It is curious therefore that TV and radio broadcast stations concentrated their attention on damage in the San Francisco and Oakland area 80 miles north. The collapse of one span of the San Francisco-Oakland bridge, the collapse of a mile of the upper deck of a major expressway in Oakland which crushed 42 automobiles, and a large spectacular fire in San which burned blocks of expensive houses and apartments on the waterfront monopolized the news broadcasts.

The media barely noticed for almost 24 hours that earthquake damage to roads and bridges had isolated the city of Santa Cruz near the epi-center where many homes were damaged. Fortunately, pre-disaster local mutual aid agreements resulted in fire engines rushing to Watsonville to help even though the telephone communication systems had been damaged. There were 17 fires almost simultaneously in Watsonville after the earthquake. One of the important lessons learned from this disaster was how vulnerable highways, commercial electricity, gas pipelines and telephone systems are in California. Another lesson learned was that important information about earthquake damage in this disaster did not get promptly to the Governor's Office of Emergency Services in the State capital, Sacramento, 200 miles away.

California's Satellite Communications for Disasters

The State of California therefore decided to invest $9 million in a satellite communications system for the Governor's Office of Emergency Services so that disaster information could be exchanged reliably in future earthquakes even though the commercial telephone system might be heavily damaged. There are 58 counties in California, so 58 satellite uplink/downlink stations were purchased, plus 4 trailer-mounted mobile stations, plus stations for the Governor's Office and 3 regional emergency operations centers. This satellite communications system is called OASIS - Operational Area Satellite Information System. Each county with its cities and special districts is now designated as an 'operational area' for disaster

purposes. Each operational area is responsible for coordination of disaster planning, response, and mutual aid within its area, and for communicating with other operational areas and with the Governor's Office and regional centers. The satellite permits each operational area to talk and send data to any or all of the other 57 operational areas, to the three regional emergency operations center, and to the Governor's State Operations Center. This system is exclusively for disaster-related information.

Disaster Information

The State next developed standardized formats for messages: a) for reporting information about disasters; b) for requesting mutual aid; c) for reporting status of operations and resources; and d) for providing information for after-action reports. This California information system is called the 'Response Information Management System' (RIMS). The information can be distributed using the OASIS satellite communication system or using other communication systems if they are operable after the disaster. RIMS uses off the shelf commercial software, Lotus Notes. Information about RIMS can be found on the State of California's OES web site which has details about all of the formats for the various disaster information reports.

The formats for distributing disaster information have been developed to follow a logical time sequence. After an event occurs, such as an earthquake, the local community prepares a basic incident report to tell all the appropriate authorities that something has happened. This is called the 'Event/Incident Report.' 'Situation Reports' are subsequently distributed to provide updated information on the incident.

'Mission Request/Tasking' messages asking for mutual aid are next sent if the disaster is so large that the resources of the local community are insufficient. The responding agency indicates whether or not it can provide the requested resources.

'Status Reports' for the Standardized Emergency Management System (SEMS) Reports Databases are prepared and distributed so that everyone will know what has happened, what is happening, and what is planned to happen in a variety of functions such as: Mass Care and Shelter; Fire and Rescue; Law Enforcement; Hazardous Materials; Medical/Health; Movements Initial Damage Estimates

The use of standardized formats by the Lotus Notes software makes it possible for all relevant organizations to put their information into the

RIMS system and update it so that everyone can receive the information simultaneously. The requests for mutual aid are directed to coordinating authorities, and the information as to whether or not the aid can be provided is available to all, since some other organization might be able to provide assistance.

Development of California's Standardized Emergency Management System

The OASIS satellite communications system and the formatted emergency information of RIMS are part of California's new Standardized Emergency Management System (SEMS). This new statewide emergency management system was developed as a direct result of a fire in California in 1991. The disastrous 'East Bay Hills' fire in Oakland and Berkeley in October 1991 resulted in 25 deaths and 150 injured. There were 3,354 houses and 456 apartments destroyed in spite of the efforts of more than 300 mutual aid fire engines brought to the disaster. This was the worst urban fire in the history of the United States with estimated cost of $1.5 billion.

There were a number of factors which were pertinent to this major disaster according to the official 'lessons-learned' report prepared by the East Bay Hills Fire Operations Review Group. The weather made fire fighting almost impossible with temperature of 92 degrees Fahrenheit, relative humidity of 16 percent, and winds of 30 knots gusting to 50 knots. The fire ignited 790 homes in first hour. It was difficult for the police to evacuate people from their homes as the fire spread because the streets were narrow and clogged with burned-out hulks of more than a thousand automobiles. The terrain was hilly with lots of trees. Many houses had wood shingle or wood shake roofs which caught fire easily.

However there were also important organizational problems. The Oakland Fire Department did not use the Incident Command System and had few formal mutual aid agreements. The Fire Department moved its field command post to three different locations as the fire spread, which made communications difficult with the Oakland Police Department which had established its command post in two different locations. The Governor of California arrived and it was difficult for him to find out who was in charge and what was going on.

Furthermore, the Oakland Fire Department had a different size fire hydrant from all other California cities so that the 300 mutual aid engines

arriving from other cities needed to use adapters which were in short supply. The Oakland Fire Department's budget had been cut so much in the preceding ten years that about 40 % of the firefighting personnel had retired without replacement. There had not been enough money in the budget for training in fighting wildland fires. Because of the small budget for modernization, the fire engines had antiquated four-channel radios for communication instead of modern sixteen-channel radios. This made it difficult to communicate with the 300 mutual aid fire engines which had arrived to try to help.

State Senator Petris, whose home in Oakland had been burned, prepared the draft of Senate Bill 1841 which was quickly approved by the state legislature and signed by the Governor. This law is found in Section 8607 of the Government Code. The intent of the law was to improve the coordination of state and local emergency response in California. The new 'Standardized Emergency Management System' (SEMS) became effective December 1, 1996.

Basic Components of SEMS

The new Standardized Emergency Management System was based on improvements to existing systems and some new concepts. The five basic components are: 1) Incident Command System (ICS) - the Incident Command System as developed by fire departments in Southern California in the 1970s will be used at the field level by all responders; 2) Multi-Agency Coordination - multi-agency coordination is the coordination among different agencies within a jurisdiction, such as Fire and Law Enforcement. Inter-agency coordination takes place between different levels, such as city police, county deputy sheriffs, State police and California Highway Patrol officers; 3) Master Mutual Aid agreement - State, counties and cities originally signed a master mutual aid agreement in 1950. This has been further developed to now cover fire, law enforcement, coroner, emergency medical and search & rescue systems; 4) Operational Area - an operational area consists of a county and all political subdivisions within that county's area; and 5) Operational Area Satellite Information System (OASIS) - a satellite communications system with a high frequency radio backup installed at each of the 58 counties, the regions and the State.

The collection of formatted message reports designed to be transmitted over this satellite system is called the Response Information Management System. Some of these aspects of standardization of disaster information

management in California may be of interest to the developers of the Global Disaster Information Network. There would appear to be numerous advantages to using standardized terminology and standardized formats to reduce the possibilities of misunderstandings particularly when a truly global system is being designed.

Other Disaster-Related Organizations

State and Local Emergency Management Data Users Group (SALEMDUG)

There have been problems after many disasters for outside organizations to provide appropriate humanitarian assistance to local communities. After a hurricane, for example, there may be many damaged houses. There may be a shortage of sheets of plywood and roofing material to make the houses temporarily habitable and keep the rain out. The community should have access to a disaster information network where these needs can be promulgated to appropriate organizations which may be able to provide the humanitarian assistance requested. The State and Local Emergency Management Data Users Group (SALEMDUG) developed a 'National Donations Information System' some years ago. The goal of this disaster information system was to allow the communities affected by a disaster to specify in detail what sort of assistance they would like to receive, where they needed it and when. It also contained information from the providers of the equipment or personnel to the recipients as to what was being provided, where it would arrive and when so that the recipients could know that their request was being filled and when it would arrive. There had been a number of unfortunate examples after Hurricane Andrew in Florida of donations which had been sent spontaneously from organizations in northern states which arrived and caused problems rather than solving problems. The specific things or equipment which arrived had not been requested and were either inappropriate, delivered to the wrong location, or were too late. These well-intended efforts had the unfortunate effect of causing all sorts of problems for the receiving organizations. A disaster information network should address this issue.

Pacific Disaster Center

The Pacific Disaster Center is a Federal information processing center located in Hawaii which is being developed as an organizational and

technological model for global, national and local initiatives in disaster management. Actually, the Pacific Disaster Center serves as a nodal model for the Global Disaster Information Network. Federal participants in this development program have included the Federal Emergency Management Agency, U.S. Geological Survey, National Oceanic and Atmospheric Administration, National Reconnaissance Office, and the National Aeronautics and Space Administration. The Pacific Disaster Center uses data from a variety of sources to produce more than 70 different products, such as tsunami travel time maps, tsunami evacuation maps, flood inundation maps, annotated imagery of damaged areas, maps of available shelters, etc.

The Pacific Disaster Center scheduled a three-day Users' Conference on April 28th-30th, 1999 at the Center located in Kihei, Maui. The purpose of the conference was to familiarize users with PDC capabilities and products and to provide a forum for users. Each user was invited to give a presentation on its organization, mission, overview of operations, recent activities, suggestions for ways PDC could assist user, and description of ways user can assist PDC. More than 80 U.S. and international organizations involved in emergency management had been invited to participate.

Western Disaster Center

The Western Disaster Center, Inc. is a nonprofit public benefit corporation which has been organized to provide for increased public safety through the enhancement of disaster and emergency management capabilities through the application of advanced technology and research associated with the establishment of the National Disaster Information Network. The Western Disaster Center is proposed as the US western regional component of the evolving National Disaster Information Network. The mission of the Western Disaster Center is to provide effective and timely dissemination of information to federal, state and local emergency commanders in the western contiguous United States. The Center is operating under NASA Ames Research Center sponsorship at the WDC Prototype Operations Facility at Moffett Federal Airfield, California. The Western Disaster Center has been working with the California Governor's Office of Emergency Services to define the California Disaster Information network. The Western Disaster Center is working on a variety of prototype and demonstration projects that demonstrate the utility and feasibility of a western US regional component of the National Disaster Information Network. Project SANCTUARY is

proposed as a pilot project focused on contingency planning for a large ocean oil spill in the Monterey Bay National Marine Sanctuary.

National Interagency Fire Center

The National Interagency Fire Center in Boise, Idaho needs a near real-time fire monitoring system for the United States. The Center started in 1965 as the joint US Forest Service/Bureau of Land Management Fire Coordination Center. It is now an interagency organization supported by the Department of Agriculture's US Forest Service, the Department of the Interior's Bureau of Land Management, Bureau of Indian Affairs, National Park Service, Office of Aircraft Services, and US Fish and Wildlife Service, NOAA's National Weather Service, and the National Association of State Foresters. The National Interagency Fire Center and the US Geological Survey are hosting a conference on GIS and remote sensing technologies, 'Crossing the Millenium: Integrating Spacial Technologies and Ecological Principles for a New Age in Fire Management' on June 15-17, 1999 in Boise, Idaho.

Global Fire Monitoring Center

The German Government, Ministry of Foreign Affairs is sponsoring a 'Global Fire Monitoring Center' as a German contribution to the International Decade of Natural Hazard Reduction. This Center is at the Fire Ecology Research Group at Freiburg University, Freiburg. The Center publishes (on the Internet) the UN International Forest Fire News. The Global Fire Monitoring Center's website had a comment on one of the reasons why the center was established in June 1998.

'However, it is evident that in many countries of the developing world the state of scientific and technical knowledge is either not known or readily accessible for developing adequate measures in fire policies and management. The fire and smoke episode in 1997-98 in South East Asia was a good example that existing fire information systems or fire management expertise was utilized to a limited extent only. These circumstances led to confusion at national and international decision-making levels and led to the delay of response by a series of national and international projects, some of them even missing the targets. This can be explained by the lack of an information system which is accessible globally.'

The Global Fire Monitoring Center has established contact at the working level with the Global Disaster Information Network. One of the

goals of the Center's research program is to be able to provide real-time or near real-time information related to fire to GDIN and similar initiatives.

National Geophysical Data Center

The National Oceanographic and Atmospheric Administration's National Geophysical Data Center in Boulder, Colorado is currently developing a near real-time multi-source active fire monitoring system. The National Geophysical Data Center gets global fire detection data from the US Air Force Defense Meteorological Satellite Program. This information should be available through the Goddard Space Flight Center.

User Needs

The Global Disaster Information Network should have the potential for providing local communities with timely alerting and warning information on disasters. For example, during the Oakland/Berkeley urban fire, the Oakland Fire Department did not really know where the fire was and where it might be spreading. The Fire Department did not have helicopters for observation, and was too disorganized to ask the U.S. Air Force or NASA for special photographic surveillance of the area of the fire by aircraft or satellite. We might some day have a similar problem in our City. Pacific Grove is adjacent to 5,000 acres of the Del Monte Forest, a golfing and expensive residential area known as 'Pebble Beach.' There was a 1000 acre fire in the Del Monte Forest in 1901. A fire there in 1987 destroyed 31 homes. This part of California has several State and National forests as well as federal wilderness areas within a few miles of our small cities. The 'Marble Cone' fire in 1976 in nearby Los Padres National Forest burned more than 150,000 acres. Just prior to the rains of the 1998 'El Nino' year, we experienced five years of drought which raised concerns about the possibilities of extensive forest fires in these dry forests and wilderness areas.

A GDIN system might be able to help us by getting fire information from NASA assets at the Goddard Space Flight Center in Greenbelt, Maryland. Scientists at the Goddard Center and the University of Virginia have recently established a new global fire monitoring Web site which incorporates satellite information from the United States and international partners. NASA's coordination of these various capabilities for detection and monitoring of fires in California could be of tremendous value to our local communities and provide us with alerting information to prevent a repeat here of the

Oakland/ Berkeley urban fire disaster. Also, the Western Disaster Center might be able to obtain unclassified imagery derived products on ocean oil spills which could alert the U.S. Coast Guard, California Department of Fish & Game and our local communities to take prompt response actions.

Conclusions

Local communities may need information on disasters such as wildland fires which might get out of control and advance on urban area, or ocean oil spills which may threaten our shoreline. The Global Disaster Information Network should have the potential of providing timely fire detection and monitoring information to the affected local cities, and alerting information on oil spills. Local communities may be able to use the resources of the GDIN to make requests for specific humanitarian supplies after a disaster. Donation information systems should be able to be of value for providing accurate information back to the local communities as to what will be arriving, where, and when.

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Chapter 11
Adjunct Professor at the Naval Postgraduate School Monterey, California – 1998 to 2000

The Naval Postgraduate School appointed me an Adjunct Professor in 1998 for two years in the Institute for Joint Warfare Analysis to participate in an anti-terrorist program. The school was attempting to obtain funding for anti-terrorism research. Congress had appropriated $300 million for anti-terrorist research activities. However, instead of giving all or most of the money to the Federal Emergency Management Agency which supported State and city emergency plans which included preparedness for terrorist attack, someone decided to give all the funds to the Department of Justice and the Federal Bureau of Investigation. To an outsider, this decision didn't make sense because the FBI knew nothing about emergency plans and disaster preparedness.

Anyway, the Naval Postgraduate School decided to start on a modest program to show the Department of Justice what a research program should include. One problem was how to prepare for the response to terrorist events when there may be multiple casualties and numerous dead and injured.

Therefore, since I was the Emergency Program Manager for the City of Pacific Grove, the Naval Postgraduate School suggested that I ask the Pacific Grove Fire Department to organize an exercise where the scenario included a terrorist attack on an aircraft so that they could collect realistic data on the time required to cut open an aircraft fuselage, remove the injured and dead crew members and passengers, triage them, and transport the injured to hospitals using helicopters and ambulances.

Assistant Chief Andrew Miller held meetings on November 4 and 19 to plan the multi-casualty incident exercise scheduled for Saturday, November 22, 1997. Engineer Dawkins arranged for 60 victims to be moulaged with simulated injuries and

fake blood between 0600 and 0800. The Emergency Program Manager assisted Professors Schacher and Maruyama, Naval Post Graduate School in the supervision of the data collection. The exercise began at 0900 and was completed at 1130. The exercise went smoothly and provided useful training to the seven fire departments who responded, police, public works, ambulance, helicopter and medical personnel at four hospitals who participated. The data collectors debriefing was completed at 1330.

I asked the manager of the McDonald's in Pacific Grove to donate 100 Egg McMuffins for breakfasts for the victims, the Monterey County Red Cross and Carmel-by-the-Sea Red Cross provided juice, coffee, doughnuts and coffee for the victims and the 25 data collectors (Defense Language Institute students). Salvation Army provided sandwiches for lunch for all participants.

The Naval Postgraduate School published three reports on this terrorist exercise and sent them to the Department of Justice, but no funding was given to FEMA or the Naval Postgraduate School.

I suggested to Professor Xavier Maruyama that we should prepare a proposal to the Natural Hazards Research and Applications Information Center at the University of Colorado for a 2003 Quick Response Research Grant. The grant application follows.

Proposal to the University Of Colorado For A Quick Response Research Grant

Local Response To Acts Of Domestic Terrorism Involving Weapons Of Mass Destruction (Or To Large-Scale Hazardous Chemical Accidents) With Multiple Casualties

Researchers:
Russell C. Coile, Ph.D, CEM, Disaster Consultant
Xavier K. Maruyama, Ph.D, Naval Postgraduate School, Institute for Joint Warfare Analysis

Research problem to be studied and type of disaster:

This proposal requests a Quick Response research travel grant for Drs. Coile and Maruyama to collect data on response by local authorities to real acts of terrorism (or to large-scale hazardous chemical accidents) with multiple casualties.

Research on response to acts of terrorism must now consider the use of radiological, chemical and biological means, referred to as weapons of mass destruction (WMD). These weapons can cause many casualties both to the general public and to first responders. The Naval Postgraduate School is carrying out research on modeling response by local authorities to such acts of terrorism. The Pacific Grove Fire Department is collecting data on response operations in multi-casualty hazmat exercises to assist in validating the models. FEMA's 'Exemplary Practices in Emergency Management' Volume III to be published in October, 1998 will include the Pacific Grove Fire Department's project 'Partnership for Preparedness against Terrorism.'

The emergency response system of local authorities must be prepared for various disasters which can result in multiple casualties, such as earthquakes, fires, hazardous material spills, airplane crashes, and multiple-car highway accidents. Incidents with many victims will overwhelm the resources of one community so that mutual aid and cooperation from neighboring communities will be required. In planning for terrorist incidents, there is increased awareness that the police, fire, and public

works departments of local cities, local emergency medical responders, and local hospitals must be prepared to cope initially alone with many casualties. It will be hours before state and federal assistance can arrive to help the local authorities.

The Institute for Joint Warfare Analysis at the Naval Postgraduate School, Monterey, California is conducting research on counter terrorism. One aspect involves modeling the local response system to determine its effectiveness. In order to develop and validate the theoretical models, it is necessary to collect real-time measurements of local response performance and reaction times in full-scale, multi-casualty, hazardous-chemical exercises.

Dr. Coile was the Disaster Coordinator/Emergency Program Manager from 1990 to 2000 at the Pacific Grove Fire Department/City of Pacific Grove, California. The Pacific Grove Fire Department was recognized in May, 1997 by the Federal Emergency Management Agency as one of 38 communities in the nation with an exemplary emergency preparedness program (see Pacific Grove — A Model for Small City Disaster Preparedness, page 25 in report 'Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management,' Vol. II, May 1997, Federal Emergency Management Agency). The Pacific Grove Fire Department had participated in the State of California's annual earthquake exercise each year for the past seven years. The Naval Postgraduate School therefore requested the cooperation of this fire department to collect response and reaction data in a series of full-scale multi-casualty training exercises (see report 'Pacific Grove Multi-Casualty Incident Drill: 22 November 1997', NPS-IJWA-98-003, Vol.1, Institute for Joint Warfare Analysis, Naval Postgraduate School, Monterey, California).

Data was collected by 23 Defense Language Institute, Monterey students during the first exercise held on November 22, 1997 when 65 moulaged 'victims' were extricated from wreckage, triaged, treated, and transported by ambulance and medical evacuation helicopter to hospitals in two counties. This first exercise has now been analyzed (see report 'Multi-Casualty Incident Exercise: Modeling, Data Acquisition, and Parameters,' NPS-IJWA-98-005, Vol.2 in a series concerning local response to terrorism, Institute for Joint Warfare Analysis, Naval Postgraduate School, Monterey, California).

The data collection methodology was effective in that it captured the significant events of the exercise to allow adequate model parameterization. The second exercise will add the complications of hazardous materials and decontamination of victims and responders, while the third exercise in this series will bring in the 'terrorists' and crime scene aspects.

There have been three recent events relevant to our terrorism research. First, Professor Maruyama and Dr. Coile were invited by Dr. Frances Winslow, CEM, Director, Office of Emergency Services, City of San Jose, California to attend some terrorism training at the San Jose Fire Training Center. The U.S. Army Chemical and Biological Defense Command is currently conducting training in 120 metropolitan areas. Dr. Winslow arranged for us to participate as observers at the table-top terrorism exercise which was held January 30, 1998, the final day of the week-long training program for the San Jose Metropolitan Medical Task Force.

Second, the Federal Bureau of Investigation, San Francisco office and California Governor's Office of Emergency Services, Coastal Region, Oakland have recently formed a 'Bay Area Terrorism Working Group' (BATWG). Professor Maruyama and Dr. Coile were invited by Barbara McPhail, State OES to present a progress report on their research project on response by local authorities to acts of terrorism involving weapons of mass destruction to the BATWG meeting in San Jose on July 29, 1998 (see report 'Baseline Exercise for Chem-Bio Terrorism Response, NPS-IJWA, July 29, 1998, Institute for Joint Warfare Analysis, Naval Postgraduate School, Monterey, California). John Lightfoot, FBI, (510) 251-4162 and Barbara McPhail, State OES, (510) 286-0895 were co-chairmen. There were about fifty participants including representatives from FBI, EPA, Contra Costa County OES, State OES, San Jose OES, U.S. Coast Guard, National Guard, Sandia National Laboratory, and local hospitals, emergency medical agencies, fire and police departments.

Third, Dr. Coile, former Director of Research, Operations Research Group, Office of Naval Research who had worked on biological warfare at Camp Dietrick, Maryland attended the Sacramento Fire Department's 1998 Hazardous Materials Emergency Response Workshop, September 8-11, 1998 and heard a number of briefings by FBI agents and others on chemical and biological terrorism.

NOTE: Although this proposal is geared for quick response to actual acts of terrorism, it should be pointed out that accidental large scale

hazardous chemical accidents with multiple casualties may provide the same opportunities for researchers to collect response data on firefighters, emergency medical units, ambulances, medevac helicopters, police evacuation operations, etc which would be useful for model development and validation.

Why research must be carried out in immediate post-impact time frame:

The response to a terrorist act will be carried out by local fire, police, and emergency medical units who are trained to respond within minutes to save lives. Since some weapons of mass destruction can result in multiple casualties within minutes, it would be desirable for researchers to arrive as soon as feasible to collect data, interview responders when they are off duty and gather information without interfering with the response operations.

Research design:

Volumes 1 and 2 of the Naval Postgraduate School Institute for Joint Warfare Analysis reports discussed above contain the detailed plan for data collection in exercises. The research design for quick response will be based on this plan but modified to face the reality of two researchers collecting data in a realistic real-world incident rather than three researchers supervising 23 enthusiastic student data collectors in an artificial training exercise.

Plan to quickly enter the field and access the data needed:

Monterey airport has frequent air service to both Los Angeles and San Francisco. We will be packed and ready to go within a few hours after hearing the news of a terrorist attack. The goal would be to reach cities west of the Mississippi on the same day of the event and cities east of the Mississippi on the next day.

Anticipated benefits of the research:

The Naval Postgraduate School's modeling research program is concentrating on the initial response by local authorities to acts of terrorism involving weapons of mass destruction. The local authorities must necessarily initially carry out their rescue and life-saving operations by themselves using their own resources. We hope to collect data to document their response which will be of value to them for their after-action report. It

may take hours for State and Federal units such as Metropolitan Medical Task Forces to arrive.

Exercise data will be helpful to validate modeling efforts in the absence of event data, but actual event data, even if fragmented and incomplete, could conceivably be of greater value for validation purposes because of its credibility. As pointed out earlier, if the actual event is an accidental hazardous chemical spill with multiple casualties, data from this 'accident' might be almost as useful as data from a chemical warfare attack planned by terrorists.

It is hoped that terrorism researchers will be accepted by the local fire, police, ambulance and hospital organizations in actual events and that they will give us access to their working records and allow us to interview participants. We have been able to establish friendly working relationships in prior earthquake and terrorism exercises with local fire, police, and hospitals. We are experienced in operations research in the field and know how to collect data without interfering with operations. We must convince the locals that we, in fact, will be working for them on a non-interference basis to collect and provide them with the detailed quantitative historical information which they need for their after-action reports.

Tentative budget based on team size, time in the field and data collection costs:

The estimated budget is $3,000 for the team of two researchers in the field for five working days, based on possible airline travel costs, hotel, meals, and car rental.

Biographical Information.

RUSSELL C. COILE, Ph.D, CEM
Disaster Consultant

Education:

S.B., S.M. and E.E. degrees in Electrical Engineering, Massachusetts Institute of Technology
Ph.D in Information Science, The City University, London, England.

Professional Certification / Registration:

Certified Emergency Manager (International Association of Emergency Managers)

Fellow, Institute of Civil Defence and Disaster Studies, London, England

Experience:
Director of Disaster Services, American Red Cross, Carmel Area Chapter, Nov 2000-Nov 2001.
Disaster Coordinator, Pacific Grove Fire Department, Jan 1990 to Oct 2000. Responsible for disaster preparedness for the City of Pacific Grove. Duties include: initiating emergency preparedness programs, revising and updating the City's Multi-Hazard Emergency Plan, designing the City's Emergency Operating Center, writing Emergency Operating Center Standard Operating Procedures, planning and conducting the City's exercises such as the participation in the annual statewide earthquake exercise each April, conducting public education programs, writing the City's Radio Amateur Civil Emergency Service Plan, organizing local amateur radio operators in the City's RACES group, teaching and organizing the City's Volunteers in Preparedness (neighborhood emergency response teams), and training all City employees in the State of California's Standardized Emergency Management System.
Special terrorism training courses at the Sacramento Fire Department's. 1998 HAZMAT Emergency Response Workshop, Sept 8-11, 199, Sacramento, California:
Terrorism and the Fire Service — Paul Deis, Paul Henlin, CSTI, San Luis Obispo
Domestic Terrorism — Robert Horn, FBI Sacramento
Biological Terrorism — Dr. E.E. Ballard, Tactical Resources and Analysis, Inc
Introduction to Terrorism — Chief J. Dunbar, Sacramento Fire Dept.
Terrorism Medical Management — Dr. S.Tharratt, University of California,Davis
Synchronized Response to NBC and IW Terrorism — L.Richards, L.A. Sheriff
Tactical Considerations for Terrorism Response — S. Patrick, FBI Quantico, VA

XAVIER K. MARUYAMA, Ph.D
Institute of Joint Warfare Analysis and Department of Physics
Naval Postgraduate School. Monterey California

Education:
B.S. in Physics, University of Notre Dame
Ph.D in Physics, Massachusetts Institute of Technology

Experience:
Professor, Naval Postgraduate School, Institute of Joint Warfare Analysis, 1998, Department of Physics, 1987. Dr. Maruyama has served in the United States Navy, worked at the National Bureau of Standards, and has had assignments at the Naval Research Laboratory and the Congressional Office of Technology Assessment. At the Naval Postgraduate School, he developed and taught courses including the physics of nuclear weapons and directed energy weapons, and technical aspects of weapons of mass destruction. His interests involve Peacekeeping and Peace Enforcement Operations, nuclear, biological and chemical warfare, military operations other than war, special operations and low intensity conflicts, terrorism, mine and countermine technology, and non-lethal weapons. Recently, he participated in research on the problem of detection of explosives as it relates to airline security, unexploded ordnance, and land mines. He was co-author of the report 'Technology for International Peace Operations', and author of 'Technologies in Support of Peace Operations' published by the Institute for Technology Assessment.

Professor Maruyama's scientific research interests have centered about physics which involve electron accelerators. This unifying theme has involved projects in nuclear and high energy physics; generation of coherent radiation; radiation effects in devices and in materials including high temperature superconductors and rare earth permanent magnets; plasma physics regarding high voltage vacuum diode breakdown; acoustics involving the detection of sonoluminescence; and applied electromagnetics measurements. His scientific publications (70 journal papers, 110 conference presentations, and 60 colloquia and seminars) have covered topics in nuclear, high energy, coherent radiation, plasma physics, acoustics, education, and electromagnetics. Professor Maruyama has supervised 65 masters degree theses.

Dr. Maruyama is interested in undergraduate and pre-college education having served as an NPS representative to the Monterey County Science and Engineering Fair Coalition which organizes the County Science Fair, Science Discovery Day and Physics Phun Phests. Dr. Maruyama is a regular contributor to the Northern California/Nevada section of the American Association of Physics Teachers. He has been a member of a Teacher Enhancement Program Panel of the NSF and has contributed to the Research Experience for Undergraduates Program at the University of Virginia. He has belonged

to Monterey Organization of Science Educators, and has served on the board of Youth Music Monterey. He is currently serving as the President of the Board of Directors of the Lyceum of Monterey County, which provides education enhancement programs for gifted children beyond that provided by the traditional school system.

Special Note: Pacific Grove Fire Department's involvement with counterterrorism activities.

The Pacific Grove Fire Department received national recognition from the Federal Emergency Management Agency for its program, 'Pacific Grove — A Model for Small City Disaster Preparedness' when it was selected after a nation-wide search for inclusion in FEMA's *Partnerships in Preparedness Volume II: A Compendium of Exemplary Practices in Emergency Management, 1997*. The Naval Postgraduate School in Monterey read about Pacific Grove's Fire Department and asked if the Fire Department could provide assistance on a counter-terrorism research project. The School was developing a model of response by local authorities to a terrorism incident and asked if the Fire Department could conduct some exercises to obtain realistic data on response activities by local fire and police. A multiple casualty exercise with 65 victims was conducted in November 1997. Mutual aid was provided by 7 nearby cities, 5 ambulances, a medical evacuation helicopter, 4 hospitals, the county coroner, and amateur radio operators. Data was collected by 23 data collectors. Subsequently, FEMA included this Pacific Grove Fire Department project 'Partnership for Preparedness Against Terrorism' in the *Partnerships in Preparedness Volume III, 1998*, http://www.fema.gov/library/lib07.htm.

Russell Coile was invited to be an evaluator for NASA for a simulated terrorist attack incident in an exercise conducted at the NASA Ames Research Center, Moffett Field, California on December 4, 1998. The scenario included a simulated nerve gas attack plus a bomb to injure first responders. He has also been an evaluator or observer in WMD exercises with biological or chemical scenarios in San Francisco, San Jose, Oakland and Alameda.

Summary of Quick Response Activities

This pre-approved Quick Response grant was never activated. The catastrophic disaster in New Orleans was in such chaos that it was decided not to add to their problems by going to try to collect any meaningful

data. In retrospect, it is felt that this was the correct decision under the circumstances. The nightly TV news broadcasts by CNN and others gave numerous illustrations of the complete breakdown of emergency management.

We did not apply in October 2006 for renewal of our grant because of my health problems involving flying and Xavier Maruyama's decision to retire from the Naval Postgraduate School on December 31, 2006.

Management of Disasters in The United States By The Department Of Homeland Security

Emergency Planning Society Annual Conference, Edinburgh International Conference Center, 5-6 June 2006, not accepted for presentation. I did not attend the conference.

MANAGEMENT OF DISASTERS IN THE UNITED STATES BY THE DEPARTMENT OF HOMELAND SECURITY

Russell C. Coile, Ph.D
Certified Emergency Manager
Disaster Preparedness Coordinator
Sand City (California) Police Department

SUMMARY

The new **Department of Homeland Security** was established in the United States after the terrorist attacks on the World Trade Center in New York City. Twenty two existing federal agencies were transferred on March 1, 2003 to this Department with a mission to prevent terrorist attacks and to prepare for and respond to both terrorist attacks and natural disasters such as hurricanes, floods, and earthquakes. Some organizations, such as the U.S. Coast Guard were transferred intact, while most of the others were transferred into four directorates.

The Emergency Preparedness and Response Directorate brought together the following agencies for disaster preparedness training and coordination of the government's disaster response:

Federal Emergency Management Agency (FEMA)
National Domestic Preparedness Office (FBI)
National Emergency Support Teams (Justice
Nuclear Incident Response Team (Energy)
National Disaster Medical System (HHS)

The Border and Transportation Security Directorate brought together various agencies in addition to the U.S. Coast Guard to improve security of borders and transportation systems:

Transportation Security Administration (Transportation)
U.S. Customs Service (Treasury)
Immigration and Naturalization Service (Justice)
Federal Law Enforcement Training Center (Treasury)
Animal and Plant Health Inspection Service (Agriculture)
Office for Domestic Preparedness (Justice)

The Information Analysis and Infrastructure Protection Directorate will analyze intelligence collected by the CIA, FBI and NSA involved in homeland security and evaluate national infrastructure vulnerabilities with help from:
National Infrastructure Protection Center (FBI)
National Communications System (Defense)
Federal Computer Incident Response Center (GSA)
Energy Security and Assurance Program {Energy)

The Science and Technology Directorate will seek to utilize science and technology to protect the homeland with help from the following:
National Biological Warfare Defense Analysis Center (Defense)
Chemical, Biological, Radiological, and Nuclear Countermeasures (Energy)
Plum Island Animal Disease Center (Agriculture)
Environment Measurement Laboratory (Energy)

The Secretary of the Department of Homeland Security had President Bush sign Homeland Security Presidential Directive HSPD-5 on February 28, 2003. HSPD-5 'Management of Domestic Incidents' outlined an action plan to develop a number of approaches to improve homeland security including:
National Incident Management System (NIMS)
National Disaster Medical System (NDMS)
National Response Plan (NRP)
Homeland Security Operations Center

The **National Incident Management System**, adopted on March 1, 2004 was a major change in management of disasters by the Department of Homeland Security. This system established standardized incident management processes, protocols, and procedures which all responders

– Federal, state, tribal, territories, counties and cities will use to coordinate and conduct disaster preparedness and response actions. Since all responders will use the same standardized procedures, they will all share a common focus whether the homeland security incident is an act of terrorism or a natural disaster. National preparedness and response will be enhanced since all the Nation's responders will have been trained to use a common set of procedures. National standardization of training, exercises, qualification, certification, communications interoperability, publications, public affairs, equipment evaluation, and disaster incident management will unify the responder community of police, firemen, public works, hospital and emergency medical response personnel.

The National Incident Management System includes an Incident Command System to manage the on-scene response in the field to an incident. An Incident Commander from the local jurisdiction is in charge of the incident. He or she will have a small staff of a safety officer, a liaison officer, and a public information officer. The Incident Commander will supervise the four chiefs who are in charge of detailed management of the response. The four functional areas are operations, planning, logistics, and finance/administration. Unified command may be established when there are multiple jurisdictions or agencies involved in order to coordinate joint decisions on objectives, strategies, plans, priorities, and public information. The local jurisdiction is in charge of management of the incident. The County's office of emergency services provides resources to support the City's response to the incident, if requested. The State's office of emergency services provides mutual aid resources from other counties, if requested, and the Federal government provides resources to support the state if requested.

The **National Response Plan** adopted in December 2004 is a major change in management of disasters. This plan assigns the responsibilities of 28 Federal Agencies and the American Red Cross to provide support to the States, if requested. This plan is an all-discipline, all-hazard plan that establishes a single comprehensive framework and mechanism for the coordination of Federal support to State and local governments. The base section of the plan describes the planning assumptions, roles and responsibilities, concept of operations, and incident management actions to integrate the efforts and resources of federal. state, local governments, private-sector, and nongovernmental organizations. The Emergency

Support Function annexes detail the missions, policies, structures, and responsibilities of Federal agencies for coordinating resource and programmatic support to States and local jurisdictions during incidents. There will be a coordinator and a primary agency for each of the Emergency Support Functions and the assignment of support agencies. For example,

Emergency Support Function #1 — Transportation
ESF Coordinator:
Department of Transportation;
Primary Agency:
Department of Transportation;
Support Agencies:
- Agriculture
- Commerce
- Defense
- Energy
- Homeland Security
- Interior
- Justice
- State

General Services Administration
U.S. Postal Service

The fifteen Emergency Support Functions are: #1 - Transportation; #2 - Communications; #3 - Public Works and Engineering; #4 - Firefighting; #5 - Emergency Management; #6 - Mass Care, Housing, and Human Services; #7 - Resource Support; #8 - Public Health and Medical Services; #9 - Urban Search and Rescue; #10 — Oil and Hazardous Materials Response; #11 — Agriculture and Natural Resources; #12 — Energy; #13 — Public Safety and Security; #14 — Long-Term Community Recovery and Mitigation; #15 — External Affairs.

The **Homeland Security Operations Center** was established in Washington, D.C. to coordinate information and resources for disasters. This is the national-level center for multiagency situational awareness and operational coordination of the federal resources and support furnished to the local Incident Commanders.

The **National Homeland Security Consortium** is an approach to involve a number of organizations for disaster preparedness public

outreach and to share information and best practices. The participating members of the Consortium are: Adjutants General Association; American Public Works Association; Association of Public Safety Communications Officials; Association of State & Territorial Health Officials; Council of State Governments; International Association of Emergency Managers; International Association of Chiefs of Police; International Association of Fire Chiefs; International City/County Management Association; National Association of Counties; National Association of County & City Health Officials; National Association of State Departments of Agriculture; National Association of State Emergency Medical Service Directors; National Conference of State Legislatures; National Emergency Management Association; National Governors' Association; National League of Cities; National Sheriffs' Association; State Homeland Security Advisors; Urban Area Security Initiative Cities; and the U.S. Chamber of Commerce.

The **Emergency Management Assistance Compact** ratified by Congress and signed into law in 1966 (Public Law 104-321) is a new system for rapid mutual aid. This mutual aid agreement between the states allows for quick response to disasters. During any Governor-declared state of emergency, this compact provides a responsive and straightforward system for a state to request another state to send personnel and equipment to help in disasters. The states can ask for whatever assistance they need including medical resources for any type of emergency from earthquakes to acts of terrorism. Forty nine states, the District of Columbia, Puerto Rico and the Virgin Islands have enacted legislation to become members of the Compact.

The **Disaster Mitigation Act of 2000** was passed by Congress on October 30, 2000 (Public Law 106-390 106th Congress). This Act encourages all states and cities to analyze the possible hazards which might occur, and plan for and take action to prevent or mitigate these hazards.

The National Fire Protection Association has developed **NFPA 1600 Standard for Disaster/Emergency Management and Business Continuity Programs, 2000**. This provides comprehensive guidance for the structure of emergency operations plans and organization of personnel and resources. The structure is as follows: 1. General; 2. Laws and Authorities; 3. Hazard Identification, Risk Assessment, and Impact Analysis; 4. Hazard Mitigation; 5. Resource Management; 6.Mutual Aid; 7. Planning; 8. Direction, Control,

and Coordination; 9. Communications and Warning; 10. Operations and Procedures; 11. Logistics and Facilities; 12. Training; 13. Exercises, Evaluations, and Corrective Actions; 14. Crisis Communication and Public Information; and 15. Finance and Administration.

The **Emergency Management Accreditation Program** is based on NFPA1600 Standard for Disaster/Emergency Management and Business Continuity Programs, 2000. A team of assessors evaluates the emergency preparedness of states, counties and cities in a five day survey. The Accreditation Program is sponsored by the Federal Emergency Management Agency, the National Emergency Management Association, and the International Association of Emergency Managers.

Community Emergency Response Teams are a program of the Federal Emergency Management Agency. The goal of the program is to educate citizens all over the United States in preparedness for the hazards in their area. Training is provided in nine units: 1. Disaster Preparedness; 2. Fire Safety; 3. Disaster Medical Operations – Part 1; 3, Disaster Medical Operations- Part 2; 5. Light Search and Rescue; 6, CERT Organization; 7. Disaster Psychology; 8. Terrorism and CERT; 9. Disaster Simulation. Training is provided in two hour units. All students participate in learning to use fire extinguishers by putting out a small fire. The students learn how to prepare their home for various disasters, have a plan including evacuation, and how to exercise their plan. Refresher classes are given for CERT members. A number of CERT members volunteered to go to Florida, Alabama, Mississippi, and Louisiana during the 2005 hurricanes to assist local CERT members.

Certified Emergency Manager is an International Association of Emergency Managers program which began in 1993. The term 'Certified Emergency Manager' or 'CEM' designates prescribed training and educational criteria plus a working knowledge of all basic aspects of disaster/emergency management that are encompassed in the phases of mitigation, preparedness, response, and recovery. The program can be used for individuals in government, business and industry, military, health care, or educational institutions.

An individual must submit an application which is reviewed by the Certified Emergency Manager Commission. The candidate must demonstrate at least three years in a disaster/emergency management position. He or she must have participated in a full scale exercise by planning, conducting

or coordinating, and/or having a major disaster or emergency role during the exercise. Instead of exercise experience, the candidate may have had experience in the response, recovery, and mitigation phases of an actual disaster. The candidate must submit the names of three references. The education requirement is that the candidate must have completed a four-year baccalaureate degree course from an accredited university. Two years of experience can be substituted for each year of college credit lacking. The candidate must have successfully completed 100 classroom hours of disaster/emergency training, and 100 classroom hours of general management training.

The candidate must have made professional contributions in at least six of a dozen different professional categories. These categories are:

A. Membership - Member for three years in a disaster-related organization.

B. Professional Conference – Participation in a disaster/emergency conference.

C. Service Role – Serve on a Board of Directors, a committee, a board, task force, or special project for s professional disaster organization.

D. Leadership Role – Serve as an elected officer or in a leadership position on a board of directors, etc.

E. Special Assignment – Be involved in a special assignment for a jurisdictional or governmental committee, or task force.

F. Speaking – Develop material and speak at public presentations including radio, television, educational video.

G. Teaching – Complete a formal teaching or instructing commitment.

H. Course Development – Contribute as a full partner in the development or extensive revision of a disaster course.

I. Publications – Publish a substantive disaster/emergency management article, research project, or instructional pamphlet.

J. Audio-Visual and Interactive Products – Develop and distribute a disaster video or computer software.

K. Awards or Special Recognition – Receive an award for disaster/emergency management-related activities.

L. State/Province Certification – Receive certification as an emergency manager through a state certification program.

M. Legislative Contact – Contact an elected representative at the state or national level regarding disaster/emergency issues.

N. Other – Other professional contributions may be recognized by the CEM Certification Commission, such as the candidate volunteered to go on a disaster assignment not in his or her jurisdiction.

The candidate must demonstrate his writing skills by preparing a 1000 word essay on a disaster problem given to him or her. The candidate's written narrative should clearly:

1) Identify the problem to be solved.
2) Identify the objective to be achieved.
3) Describe the necessary actions.
4) Describe the intended outcome.
5) Describe the human resources utilized in the process.
6) Describe the material and financial resources utilized.

Finally, the candidate must successfully pass a written examination on disaster/emergency management.

Conclusion

There have been many changes in management of disasters in the United States since the Department of Homeland Security was established. Many of these changes have been made within the past twelve months so that they are in a transitional stage. Training and exercising is required so that the participants can begin to understand their new roles and responsibilities. The hurricanes of the 2005 hurricane season have highlighted the necessity for emergency managers to understand and take advantage of the new principles and procedures of the National Incident Management System and the National Response Plan and all the other changes in disaster management briefly discussed in this paper.

Biographical Information on Russell C. Coile, EPS Member No: 2652M
S.B., S.M., and EE degrees in Electrical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts.
Ph.D in Information Science, The City University, London, England
Fellow, Institute of Civil Defence and Disaster Studies
CEM (Certified Emergency Manager) 1993
Professional Engineer (District of Columbia)
Professional Engineer (Pennsylvania)

See resume in www.disasterman.com
Who's Who in America
Who's Who in the World
Who's Who in Science and Engineering

Dr. Russell C. Coile, Certified Emergency Manager was Disaster Coordinator at Pacific Grove (California) Fire Department for 10 years. He was later Director of Disaster Services at Carmel-by-the-Sea Chapter of the American Red Cross for a year. He is now Disaster Preparedness Coordinator at Sand City (California) Police Department.

Dr. Coile visited the Chinese Academy of Sciences, Beijing on a National Science Foundation researcher exchange travel grant for earthquake preparedness discussions. He presented technical papers on the U.S. State Department's proposed Global Disaster Information Network in Mexico City, Mexico, Ankara, Turkey, Reykjavik, Iceland, Bournemouth, England, Honolulu, Hawaii and Edmonton, Canada.

He served on the Certified Emergency Manager Commission for six years. He is now an Emergency Management Accreditation Program assessor and a CERT member.

Chapter 12
American Red Cross, Carmel-By-The-Sea – 2000 to 2001

My first 100 days on the job at the Carmel-by-the-Sea chapter of the Red Cross were busy. "Busy" is the one word that describes working at the Red Cross. I should have known it would be like this before I came to Carmel searching for a mid-life career change after I had been the Disaster Coordinator at the Pacific Grove Fire Department for ten years. I thought that I knew something about the Red Cross. I began taking Red Cross courses in 1989 since I wanted to invite Red Cross participation in the State's annual earthquake exercise each April. The Carmel-by-the-Sea chapter's activities helped the Pacific Grove Fire Department to get national recognition from FEMA twice: first as a model city for earthquake preparedness, and the next year for assisting the Naval Postgraduate School in research on response to terrorism. My Fire Chief had volunteered me to be on the Red Cross Tri-County Community Disaster Preparedness Committee for four years. I also was on the Board of Directors of the Red Cross Northern California Disaster Preparedness Network for two years. During the March 1995 floods, I was one of the amateur radio operators at the chapter house on the 4 pm to midnight shift.

I have been particularly busy with community disaster education and community collaboration activities. I didn't know that there are more than a dozen churches in the Carmel area. I was going to each church to give talks on hazards we should prepare for: earthquakes, floods, and fires. I invited the members to take basic Red Cross disaster courses, such as Introduction to Disaster Services, Mass Care, and Shelter Operations. We hoped that we could interest enough members in each church in becoming volunteers that we could build the nucleus of a shelter team there. We were also asking each

church to sign a letter of understanding with regard to setting up a Red Cross shelter in the event of a catastrophic disaster.

My mother had been a Red Cross volunteer for more than 30 years and thus I was brought up in a home where the walls were covered with Red Cross certificates.

While I was the Director of Disaster Services I received an interesting e-mail one day from Dr. Nina Forlova, a Russian seismologist I had met in Amsterdam several years earlier. The Russian Academy of Sciences invited me to come to Geneva, Switzerland for a week (all travel and living expenses paid) to the founding conference of a new organization, "World Agency for Planetary Monitoring and Earthquake Prediction." I presented a paper in Geneva on May 21, 2001.

50th Wedding Anniversary

When our 50th Wedding anniversary came along in December 2001, Ellen didn't want a big "do." She wanted just close friends and family, in our home, and she wanted to cater it herself. Our house isn't huge, but we put card tables in the dining room, hall, living room and conservatory. Ellen had white tablecloths with a gold overcloth. For flowers she managed to get freesia, which is her favorite flower and had been in her bouquet. She wore her wedding dress. I had a cake made, but it wasn't nearly as good as the one Ellen's sister-in-law had made with rationed ingredients back in 1951!

Ellen agreed to hire some professional servers but she cooked everything herself, except the cake, and she wished she had done that.

I gave Ellen a ring with five small diamonds – one for each decade. Everyone said nice things, Quaker style.

General Ray Davis

The Marines' Memorial Association of San Francisco, California presented a lecture "Commemoration of the Battle of the Chosin Reservoir during the Korean War." The guest speaker was General Raymond G. Davis, USMC (Retired). The lecture and reception took place on Friday the 22nd of November, 2002.

General Davis received the Medal of Honor for this particular operation which took place between December 1 and December 4, 1950. Lt. Col. Davis commanded the 1st Battalion 7th Marines. He was asked to relieve a rifle company that had been cut off and defend a vital mountain pass which controlled the only route available for two Marine regiments in danger of being cut off by a numerically superior Chinese force during their redeployment to the port of Wonsan. The temperature was below zero and the Chinese had three divisions or more that were surrounding the First Marine Division which was below full strength. It was slowing and the weather was terrible so aircraft from the carrier aircraft were not able to provide close air support. Col. Davis and his battalion of 1,000 men were able to hold off the Chinese at the pass so that the two Marines regiments were able to get out to the coast. For this he received the Medal of Honor.

After I heard the General give his talk at the Marines' Memorial, there was a reception and a receiving line. When I got to the General, I introduced myself and explained that I had been his guest for three weeks in November 1968. He had taken me everywhere in his helicopter the first week I was there and to refresh his memory I reminded him that the division Sergeant Major had been killed during the time I was there. I thanked him for writing his autobiography which he signed.

9/11

When 9/11 occurred, our phones at the Red Cross started ringing off the walls. I was made responsible for handling volunteers. It seemed like every therapist within fifty miles wanted to fly to New York, at the Red Cross' expense, to offer grief counseling, even though they had no prior Red Cross training or certification. It was a stressful environment because of the shock and nature of the 9/11 event. Handling so many calls of this nature wasn't quite the scope of work I had expected so I was glad to move on.

Chapter 13
Disaster Preparedness Coordinator – 2002 to the Future

I became a "disaster consultant" after ten years as the Disaster Coordinator at the Pacific Grove Fire Department and one year as Director of Disaster Services at the Carmel-by-the-Sea American Red Cross chapter. Andrew and Jonathan fixed up an Internet website for me at www.DisasterConsultant.com which automatically redirects to www.DisasterMan.com, with three pictures of me when you open it.

I reviewed the draft of a college-level textbook for the Federal Emergency Management Agency which is encouraging at least one university in each state to give courses in emergency management. I presented a paper on Homeland Security at a conference of The International Emergency Management Society at the University of Waterloo, Toronto, Canada in May, 2002. Ellen had gone with me to Delft University several years ago to this same group and planned months ago to go to Toronto with me, however, her doctor wouldn't let her fly so soon after her hip surgery. Ellen insisted that I stay over three days with Clair and Ian Finch, her English friends, so that I ended up attending a gardening class and know all about making a garden in a hanging basket. I also went with Claire to a garden show as her proxy.

I prepared for possible consulting projects at the Naval Postgraduate School in Monterey, where I was an Adjunct Professor on Terrorism for a couple of years, but nothing firm materialized out of that. Professor Xavier Maruyama and I had a pre-approved Quick Response research grant from the University of Colorado to go immediately to any terrorist incident. I presented a couple of papers ("Disaster Education for Children" and "Citizen Corps Volunteers") on an Internet virtual conference - the UN/ISDR Earth Summit 2002 on Sustainable Development. I also attended the twelve week

Pacific Grove Citizen's Police Academy (Ellen was in the first class) and then became involved in their volunteer activities with Ellen.

One day I began to really look for disaster consulting jobs. I dropped in for a courtesy call on the Police Chief of Sand City. I had met him about ten years earlier under interesting circumstances. When I was the Disaster Program manager at the Pacific Grove Fire Department, I had a good City Manager who believed in preparedness for earthquakes. The State of California had a series of professional emergency managers as the Governor's Director of Emergency Services. Therefore, the State for about 19 years had a statewide earthquake exercise at 10:30 am on the first Tuesday in April each year. The Department of Education took this seriously as it also scheduled regular fire drills to practice evacuation of students. In the earthquake drills the students and teachers practiced dropping to the floor, crawling underneath a desk or table and holding on (in case the table began to move across a tilting floor). The City Manager approved my recommendation each year that the City of Pacific Grove participate in the State's annual earthquake exercise for the ten years I worked for the City.

I thought that it was sad that none of the eleven other cities in our Monterey County ever participated in those ten years. Even worse, the County's emergency manager was unable to persuade the County's Administrator to approve participation in this State-wide drill. He or she apparently was not interested in earthquake preparedness. Therefore, I proposed to my City Manager that we host an earthquake preparedness workshop and invite these eleven other cities to send representatives to find out what they had to do to increase their preparedness. I wrote a "Paint by the numbers" model of an Emergency Operations Plan to be given to each city which a small city could easily modify to personalize it to their own city population, geographic features, fire, police, public works, and ambulance resources. We then walked them through a brief drill where we showed them how to turn

any conference room into a temporary emergency operations center within an hour at no expense.

There were representatives from seven cities including one mayor, several city managers, and a bunch of Fire and Police Chiefs and Public Works Superintendents.

When I went to Sand City, the Police Chief remembered me from this workshop. I asked him if he ever needed any disaster consulting help, such as updating Emergency plans, to remember that I was available (euphemism for unemployed). The Chief surprised me by asking "Could you start here on a full-time basis tomorrow?" I thought that he was joking, but he was serious. He explained that the City's Emergency Operations Plan was indeed about ten years old and needed updating. He then got down to the nitty-gritty. "I have a policewoman who was assigned to rewrite the plan, but she is a Criminal Investigator in a Military Police Company of the US Army Reserves. Mary was just called to active duty and sent to Iraq two months ago for perhaps a year." He then explained that his budget didn't have any money at all for consultants, but he would make sure that if I came there as a full-time volunteer he would make me a full-fledged member of their Police Department family, which consisted of three sergeants, seven officers, and a police records administrator.

That was in May 2003. I found it an interesting and fun place to work. I immediately started to work on the plan. The disaster situation in the United States had changed with the establishment of the Department of Homeland Security. I wrote the new plan using the guidance of the National Fire Protection Association NEPA 1600 Standard on Disaster/ Emergency Management and Business Continuity Programs 2004 Edition.

MEMORANDUM 05/13/03

To: **Chief Klein**
From: **Russell Coile**
Subject: **Progress Report, May 12, 2003**

1. This is the first of a series of regular progress reports which will be prepared each Monday to report on progress in disaster preparedness for the previous week. Since it is the first report, a brief summary of responsibilities will be presented.
2. Responsibilities of Disaster Preparedness Coordinator:

A. Update and maintain the Sand City Emergency Plan.

B. Train appropriate Sand City personnel with disaster preparedness responsibilities to staff the Sand City emergency operations center during a disaster, including using the State's Response Information Management System (RIMS) for requesting assistance and reporting to the Monterey County Operational Area.

C. Implement all disaster preparedness required tasks and duties as mandated by County, State and Federal regulations.

D. Coordinate preparation and submission of all required disaster reports and plans in a timely and accurate manner.

E. Train all new Sand City employees in the State of California's Standardized Emergency Management System (SEMS).

F. Coordinate emergency services planning between Sand City and: Monterey County Operational Area Office of Emergency Services; adjacent jurisdictions of Monterey, Seaside, and Marina; U.S. Coast Guard; Seaside-Sand City Chamber of Commerce; American Red Cross; Salvation Army; PG&E; Cal-Am Water; Sand City Citizen Corps Council; and other agencies as appropriate.

G. Provide disaster preparedness training and appropriate educational information for residents, community groups, and the local businesses in Sand City, including business continuity training.

H. Introduce Citizen Corps activities sponsored by the Department ot Homeland Security, Department of Justice, and Federal Emergency Management Agency, such as Neighborhood Watch, Volunteers in Police Service, and Community Emergency Response Teams.

I. Develop a volunteer amateur radio station for the Sand City emergency operations center.

J. Coordinate disaster preparedness training for appropriate Sand City employees at the California Specialized Training Institute, San Luis Obispo, and FEMA's Emergency Management Institute, Emmitsburg, Maryland.

3. Progress: My initial days at the Sand City Police Department have provided useful orientation and the practical side of familiarization with my computer. I will therefore only report on only one of my projects in this progress report — update the emergency plan.

In order to do a better job in updating the Sand City Emergency Plan, I attended a two-day training course at the emergency operations center of the Governor's Office of Emergency Services in Sacramento on May 1 and 2. I received training to become an assessor in a new national program called Emergency Management Accreditation Program (EMAP). In 1997 the Federal Emergency Management Agency promulgated a State Capability Assessment for Readiness (CAR) program for a state to assess its emergency management program. All states completed self-assessments in 2000. Now, a new program of accreditation of a state's emergency management by external assessors has begun in 2003. This will be conducted by a team of external assessors. I passed the Emergency Management Accreditation Program (EMAP) exam and am now in the cadre of assessors. I had to agree to go on at least one and perhaps two or three one-week assessments within the next twelve months to become a certified EMAP assessor.

My reason for going was to find out the new national standards for satisfactory emergency plans. FEMA promulgated guidance for Local Capability Assessment for Readiness (CAR) for counties and cities in April 2001. I will use this as guidance for updating the Sand City Emergency Plan. Also, I must ensure that the updated Sand City plan meets all the requirements of California's Standardized Emergency Management System (SEMS), adopted in December 1996.

Professional Papers

My Police Chief encouraged me to keep active in disaster preparedness circles and attend conferences. There is a listing of professional papers I wrote on Emergency Management topics in the Appendix.

Text Book Reviewer

One day I read on the Internet that FEMA's higher education program at Emittsburg, Maryland was inviting volunteers to review the draft of a new college-level textbook on emergency management. Since I had enjoyed being a

volunteer reviewer some years ago for three other textbooks, I sent them an e-mail volunteering to review this one. I had 30 days (weekends and evenings) to review a 500 page draft. It was very poorly written in my opinion.

Who's Who in America

Early in 2003 I was pleasantly surprised to receive a letter from *Who's Who in America* telling me that I had been selected to be in the forthcoming *Who's Who in America 2004* edition.

Years ago I had been in the regional *Who's Who in the South and Southwest* in 1967, and in *Who's Who in the East* in 1972 so it was great to get promoted to the big time.

American Men of Science

I have been in *American Men of Science* every year since 1955. The title was changed to *American Men and Women of Science* to be politically correct some years ago.

Certified Emergency Manager (CEM)

Another honor – Ellen and I went to the 1993 annual conference of the International Association of Emergency Managers in South Carolina. There was a big ceremony when the Governor of South Carolina awarded certification to me in the first group of managers to be registered as Certified Emergency Managers (CEM). FEMA had originally given a grant to IAEM to develop this system. To become certified, one had to have worked for at least three years as an emergency manager; worked in a real disaster such as an earthquake, hurricane, flood, etc; taken a zillion courses in emergency management; belonged and participated in professional emergency associations; taught, or lectured; published papers; wrote an essay; be a college graduate or have years and years of experience, etc. The idea was to prove to the world that one is qualified like certified public accountants, or attorneys who pass bar exams. One had to send an application which might be more than 100 pages in length to a commission which would check everything and accept or reject your application. I later served two three-year terms on the CEM Commission

which reviews CEM applications. One had to re apply every five years to keep your certification.

Lifetime Award

In November 2003 I was voted a **Lifetime Certified Emergency Manager®** at the annual conference of the International Association of Emergency Managers in Orlando, Florida. I received the honor of Lifetime designation for: a) receiving three FEMA awards for exemplary practices in emergency management; b) presenting 50 papers in disaster conferences in Mexico, Canada, Turkey, Iceland, the Netherlands, United Kingdom, and the United States; c) publishing 14 papers in international disaster journals; and d) receiving a National Science Foundation researcher exchange travel grant to visit the Center for Disaster Reduction, Chinese Academy of Science, Beijing for two weeks, to give a seminar on earthquake preparedness.

David Craig

On June 6, 2006 Ellen and I attended the Stanford University graduation ceremonies. My great nephew, David Craig, was one of 1,860 undergraduates at Stanford who were graduating after four interesting college years.

I have one sister, Thelma. It was interesting that Thelma had decided to train at the University of Hawaii to become a teacher. She selected some math courses so that she could teach math in elementary school and junior high. She found that most women avoided taking math courses at the university with the result that she was usually the only woman in her math courses.

When she graduated in 1933 she decided to stay in the Territory of Hawaii and teach on the big island – Hawaii – at an elementary school at a sugar plantation called Laupahoehoe, about 20 miles from Hilo, the only town on the island. She met the chemistry instructor at Hilo High, they married about six months later, and they both applied for transfers to the island of Oahu.

Nessly, my nephew, was their only child. Thelma's husband died a couple of years later from brain cancer. He traveled to the Mayo Brothers Clinic in Rochester, Minnesota, but they told him they couldn't do anything to help him. After World War II, Thelma married an Army Officer from Detroit named Robert Craig and he adopted Nessly and changed his name from Brown to Craig.

When Nessly grew up, he studied at Reed College in Oregon and then studied for a Ph.D in biology at the University of Pennsylvania in Philadelphia. He met Sue who was also at Penn a year behind him. They married and Nessly got an interesting job at a cancer research lab in Philadelphia. Sue decided to finish her Ph.D at Johns Hopkins in Baltimore. She was so exceptional that the Medical School hired her to teach would-be doctors. She was one of the first women to get on the faculty. Nessly got a job at the small new University of Maryland-Baltimore County campus nearby.

David arrived a few years later – their only child, as it turned out. David, my great nephew, had a good home life – two talented biologists who encouraged him to do everything he became interested in. For example, he expressed interested interest in music. They encouraged him when he decided to take trombone lessons and be in his high school band. He was so good at trombone that he was selected from bunch of competitors to be in the State of Maryland's All Star High School Band. He then built a recording studio in the basement of their home and formed a jazz band to play for high school dances. They actually recorded some of their best numbers and sold the recordings to their friends.

He became interested in computers. He had a cousin who was a golfing type and the two of them formed a company and developed a software program for high school golfers. Their program recorded the golfing scores and all the pertinent details of high school golfers who were hoping to get noticed by college golf coaches. A number of the best golfers were thus able to get college scholarships as the program highlighted their skills compared with those of competitors.

He developed a software program for the local American Red Cross Chapter which would keep track of which of the 40 or so Red Cross Training courses volunteers took and which courses they would need to take to become qualified shelter managers, etc. The Red Cross treated him very badly, in my opinion, and gave him nothing for developing all of this specialized software while Red Cross National headquarters was spending thousands to develop a similar program which was not as good.

David made good grades and applied to several top colleges. He decided to go to Stanford in the ancient tradition of East coast students going as far west as possible so as to have the fewest visits from parents who would naturally come to look over their shoulders.

To make a long story shorter, David received his Master's in Biology on June 16, 2006 and his Bachelor's in Biology on June 18, 2006. He had taken extra courses each semester and therefore completed all requirements for both degrees in four years. Oh, by the way, his bachelor's degree was awarded with honors and with distinction.

His last two summers he worked as a research assistant for one of his professors. This professor is internationally famous for studies of DNA using worms. He has a special microscope which Zeiss built for $100,000. The worms are translucent and apparently they can study some changes in DNA in the worms. I looked through the microscope and saw the worms but I don't understand enough biology to know what was happening.

David took the exam for medical school a few months prior to graduation. Apparently his results were in the top 1 percent of the 35,000 applicants taking the test at that time. His mother who teaches at Johns Hopkins Medical School told my wife Ellen that that would almost guarantee his admission to any medical school he decides to apply to.

However, David felt a little burned out after four busy, busy years at Stanford. He decided to take a year off to make some money before he goes to medical school by working at

the Howard Hughes Medical Research Center for a year, while applying to medical school. He was accepted at numerous schools, including Columbia, Harvard, UCLA, and Cornell but decided to go back to Stanford.

90th Birthday

March 11, 2007 was my 90th birthday. Dr. Xavier Maruyama, just retired from being a Naval Postgraduate School physics professor, was now the publisher of the *Pacific Grove Hometown Bulletin.* As a joke, he wrote an article about this event which he published in March 2007.

90th Birthday Russell C. Coile, www.DisasterMan.com, by Xavier K. Maruyama, *Pacific Grove Hometown Bulletin,* March 7, 2007, Page 11.

Russell Coile turns 90 years old on March 11, 2007. Most who have reached that milestone are spectators of life and rely upon others to take care of them should an earthquake, flood, or other disaster occur. Not Pacific Grove's Russell Coile. He is the one to whom many municipalities turn, to prepare for those unexpected eventualities.

Dr. Russell C. Coile, Ph.D, is a Certified Emergency Manager in the field of Disaster Preparedness and Management. Reaching his age, you'd expect Russell to be sitting on accolades from his lifetime accomplishments, but that's not his style. Russell is currently the Disaster Preparedness Coordinator for the Sand City Police Department. He was the Disaster Coordinator in the Pacific Grove Fire Department for the last decade of the 20th century. As a Certified Emergency Manager with credentials from the International Association of Emergency Managers and as a Fellow of the Institute of Civil Defence and Disaster Studies of London, England, Russell has been tapped for his expertise by many agencies including, locally, the American Red Cross and the Naval Postgraduate School.

Disaster Preparedness Management is an emerging profession, not one that was offered as a career path when Russell, born in 1917, was growing up as the son of a career Army master sergeant. He received his S.B., S.M., and E.E. degrees in Electrical Engineering from the Massachusetts Institute of Technology. (If you see a snazzy Mazda sports car with the license plate 'MIT 38', give him a wave.) He did a lot of things, but along the way, he managed to find time to pick up a Ph.D in Information Science from the City University, London, England; complete the Senior Officer Course from the Naval War College, Newport, Rhode Island; and take the Squadron Officer Course, Command & Staff Course, and become an Air War College graduate from Air University, Maxwell AFB, Alabama. Russell Coile is a Professional Engineer with licenses from both the District of Columbia and the state of Pennsylvania.

In his spare time, he managed to work for a living. He was commissioned in the U.S. Army Signal Corps after graduation from college and maintained

his status as a reserve officer, retiring as Colonel, U.S. Air Force. (Russell makes a great chutney, so we call it Colonel Coile's Chutney.) After his active duty service in World War II, Russell was one of the original members of the Operations Evaluation Group (OEG), who applied the emerging science of operations research to real operational problems faced by the military. The success of the OEG led to the creation of organizations such as the Center for Naval Analysis (CNA) and the RAND Corporations, both federally funded research and development centers, FFRDC.

He moved on from there to working for KETRON, Inc. in Arlington, VA; Planning Research Corporation at Fort Ord; and the VRC Corporation. His expertise in operations and analyses techniques allowed him to work in fields which required integration of a variety of seemingly disparate activities. Command and control, total quality management, test and evaluation, mass transit system emergencies, and the understanding of how to make individual actions meld together to achieve a system goal are all the work experiences which lead Dr. Coile to become a world expert in the field of Disaster Preparedness.

All work and no play make Jack a dull boy. Russell is not Jack, although you might consider him a sort of Jack-of-all-trades. He is an active amateur radio operator and served as the president of the Naval Postgraduate School Amateur Radio Club. He managed to incorporate his ties to the amateur radio community so that short wave radio capabilities are available to local first responders in the event of disasters.

His personal life is even more fulfilling. He found his bride of fifty-two years, Ellen, while he was stationed in England shortly after World War II. Ellen's story is also compelling and deserves a later column.

Russell Coile has five children (children does not seem quite the right noun when they are all adults. However, offspring doesn't seem proper.) Russell Jr., his deceased eldest son, was a world renown medical administrator and author; Chris is the founder and owner of Champion Realty, the largest real estate firm in Maryland; Jon is a sailor, pilot and the President of Champion Realty; Jennifer works in urban planning and city management; and Andrew is on the CSUMB faculty and is pursuing a doctorate program in computer science at UC Santa Cruz. Whenever the Coiles have a family gathering, it is a convention. There are grown children, grandchildren, son- and daughters-in-law and friends. Surrounded by so many loving people, I don't see how Russell can keep everyone straight

without a program. I've made the mistake of calling Andrew, Jon and Peter, Paul, but I've never seen Russell struggle to keep names and faces together.

When I grow up, I want to be like Russell. Happy 90th Birthday, Russell Coile.

A few days after the Bulletin was published I received a telephone call which went something like this: "This is Dorothy Dean Stevens. I read an interesting article about you in the Hometown Bulletin. I live on the ocean a few blocks from your house. Since I am three weeks older than you are, why don't you come over some afternoon at 4 o'clock for a cup of tea?" I went over to meet her and had an interesting hour as she told me of her life as a ballet dancer and teacher. I, of course, asked her if she was planning to write a book about her life since she had told me so many stories about studying ballet in London at the Royal Ballet School. She said that her children had been urging her to write a book and that she had assembled a lot of photographs and had actually written perhaps half of her book.

Two years later I read that she had finished her book which was published by iUniverse. The title is "Dancing Through Life on the Monterey Peninsula and Beyond - Memoirs of Dorothy Dean Stevens." I bought a copy of the book and went to her house to ask her to autograph it for me. After I finished reading it, I wrote a book review about it for the *Hometown Bulletin.*

BOOK REVIEW, By Russell C. Coile, *Pacific Grove Hometown Bulletin,* October 7,2009.

'Dancing Through Life: On the Monterey Peninsula and Beyond,' By Dorothy Dean Stevens, iUniverse 2009, 216 pages, $27.95. ISBN: 978-0-595-48441-6 (pbk), This book is available at the Pacific Grove Heritage Society Barn (605 Laurel Ave - Open Saturdays from 1 to 4 P.M.).

This memoir is a fascinating history of dancing on the Monterey Peninsula beginning in 1947 when Dorothy Dean established her School of Dancing where she taught classic ballet, modern dance and tap dancing to tiny tots and teenagers. She soon expanded into ballroom and folk dancing for adults. Within a year she was asked to open a studio at Fort Ord to offer classes in ballet and tap for children of military families. Next came teaching ballroom and folk/square dancing at the Stilwell Hall Soldier's Club.

To improve the quality of instruction Dorothy went on three Ballet Study Tours of Europe sponsored by the Student International Travel Association — Two weeks study in Paris followed by two weeks study in London, followed by four weeks traveling throughout Europe. In London they studied at the Sadlers Wells Theatre Ballet Company one trip and at the Royal Ballet School on the next trip. The traveling was to countries such as Switzerland, the Netherlands and Italy. An advantage of the organization of these study tours was the opportunity to meet famous ballet folks such as Margot Fonteyn who autographed a photo to Dorothy, 'With Best Wishes to Dorothy Dean, Love Margo Fonteyn' which Dorothy was proud to hang in her Dorothy Dean Dance Studio.

Dorothy was asked by wives of Naval officer students at the Naval Postgraduate School to give classes in ballroom dancing to boys and girls ten years of age to eighth grade to prepare them for Junior Cotillion and to high school age children for Senior Cotillions. Leon Panetta was one of Dorothy's students. Many years later an article in the Monterey Herald newspaper asked, 'Why doesn't Leon Panetta run for office?' Then the article read, 'because his Cotillion dance card is filled.'

David Stevens, Dorothy's husband died in 1987 when he was 67 years old. Five or six years later, travel and adventure became a part of Dorothy's

life. There are a number of photographs in this book. I liked the one of Dorothy riding on an elephant. Dorothy went to Japan, then to China with Colonel Gregg McKee's tour group on a river boat up the Yangtze for three days. Burma, Thailand, Hong Kong, Paris ,Portugal, Kuala Lumpur, Malaysia, Jakarta, Singapore, Taipei, Laos, Katmandu in Nepal, Mexico's Yucatan Peninsula, Istanbul, Ankara Turkey. Etc. You get the drift.

This is an interesting book!

"Disaster planning, according to Coile," by Susan Cantrell, Monterey Herald

The Sand City Police Department had an interesting tradition. If a Police Officer were mentioned by name in the newspaper or interviewed after arresting a bank robber, he or she had to buy enough pizzas for lunch for all the other Police, Public Works and City Hall employees. I just happened to be interviewed by a woman reporter for the Monterey Herald newspaper who wrote a weekly feature column each Sunday called 'Quotable Notables.' This cost me $67.97 for lunch for everyone. Here it is.

"Disaster planning, according to Coile," by Susan Cantrell - Quotable Notables, *Monterey Herald* newspaper, Sunday, Aug. 22, 2004

When there's an oil spill, a bio-terrorism attack, an earthquake or tsunami–who ya gonna' call? No, not Ghostbusters.

Russell Coile, www.DisasterMan.com, is your man. He lives in Pacific Grove and serves as disaster preparedness coordinator for the Sand City Police Department.

With more degrees than a thermometer, including a Ph.D, he has lectured to scientists, governments, military institutions and universities around the world on how to prepare for a disaster and its aftermath. And he and his English wife, Ellen, walk their talk.

We meet at their home, surrounded by lush English gardens pulsing with flowers, grasses and herbs. Nestled into one corner is an earthquake-proof storage shed filled with everything from emergency food to sleeping bags and flashlights–all labeled meticulously and re-supplied every six months. Their home is bolted down.

Russell stands tall in a crisp white shirt and red tie. 'When I was at Massachusetts Institute of Technology, I got brainwashed into thinking you had to wear a coat and tie,' he says. 'I'll never be a Californian.'

Ellen is more casually dressed and arranges freshly-cut flowers while her husband gives me the grand house tour. First, we note his brag room, where he announces, with a modicum of modesty, 'Next year I will be in 'Who's Who in the World.' I consider it a great honor.'

We continue a tour of each room, decorated with tastefully ordered collections. Then there's the pantry, stocked with rows of canned fruits, jams and Coile's chutney. Again, all neatly labeled.

This impeccable lifestyle has to serve Coile well when creating order from chaos.

Q: Are you the obsessive compulsive one?

A: (laughs) I'm a straight-arrow type. But Ellen is much neater.

Q: Does your sense of order help maintain your 52-year marriage?

A: The secret to marriage is to be polite. And we always touch as we pass, just as ants do. It's a kind of acknowledgement.

Q: So, isn't disaster on everyone's mind? What with impending terrorist strikes, earthquakes and global warming?

A: You'd be surprised at the apathy.

Q: What's the most common misconception?

A: It won't happen here and they are gonna come and take care of you.

Q: Is there any way we can empower ourselves in the looming shadow of terrorism?

A: Yes. The role for ordinary citizens is: notice anything unusual. There's virtually no traffic on our street. So, if someone parked a truck, for instance, and left it a couple days, we should tell the police or FBI about it. The Oklahoma City bombing, etc., were local bombers–not people from Saudi Arabia. There is potential for local, home grown terrorists. In recent years, there have been a number of zealots. We're so attuned to foreign terrorism we're not looking in our own back yards.

Q: What prepared you for your expertise in disasters?

A: I'm just an ordinary person. That's the odd thing. I was born in Washington, D.C., in 1917 and my father became an officer. I had strict upbringing living on Army posts and sheltered communities. The Army is prepared to help in any sort of a disaster, whether it be a flood or foreign war.

Q: What would scare you spitless?

A: (laughs) I wouldn't like to jump out of airplanes and I never did like roller coasters.

Q: What was your biggest personal disaster?

A: I was married just after WWII to a teenager. It lasted nine years and we had three children, but it was a disaster. I was on an aircraft carrier

when a letter arrived that said 'goodbye,' she'd already found somebody else. But I landed on my feet and met Ellen.

Q: What was your life's dream?

A: I always wanted to be an engineer. At age six, my father brought me a worn out watt meter, and I attached strings to it, pretending it was a power generator for my sister's dollhouse. At 17, I got a scholarship to MIT, where I got a master's and commission in the U.S. Army.

Q: And you like to ham it up, right?

A: I've been an amateur radio operator since age 14. And when I was at MIT, as secretary of the club, in 1936, there was a big flood in Pennsylvania. We were the ones helping organize food.

Q: Describe a particularly memorable disaster.

A: I was a magnetician for the Carnegie Institution of Washington, D.C., and doing research at a geophysical observatory at Huancayo, Peru, in 1940 when there was a big earthquake that broke our seismograph. I was in Lima, riding an electric streetcar that jumped off its tracks. The wires overhead were sparking, houses were crumbling, 200 died. So I headed down to the harbor. I didn't realize people were walking away from the ocean because they'd experienced a tsunami before. I didn't speak Spanish... Also, I was in the first group of certified emergency managers that was sent down to Northridge seven days after the earthquake. It was awful to see all these office buildings and apartments that had collapsed. To be there and see all these poor people who refused to go into Red Cross shelters, in the rain huddling underneath card tables with plastic over them.

Q: How did you become disaster planning coordinator for Pacific Grove?

A: There was an ad in the paper that they wanted someone to finish rewriting the city's earthquake plan. People don't want to accept the fact that this is earthquake country. We've had two (big ones) in the last 15 years and the geological survey says there's a very big possibility within the next 30 years that we'll have one like the San Francisco quake in 1906... I became an expert and began giving talks all over the world. We got the Pacific Grove Fire Department national recognition from Federal Emergency Management Agency and we got a travel grant to go to China to lecture at the Chinese Academy of Science about quakes. Ellen went with me.

Q: Of your hundreds of papers, you presented one at Monterey Institute of International Studies on 'Emergency Response: Terrorism and Schools.' When you go into the schools, what reactions do you get?

A: There is apathy with adults, but children were very interested. I'd take a portable house around and we'd act out disaster preparedness in it.

Q: What do you know about oil spills?

A: After the Exon Valdez disaster with the poor birds and otters, the Coast Guard was given money by Congress to design plans for the east and west coasts. Now it's a very good system… they're trying to get tankers further away from land.

Q: You and Ellen volunteer with Pacific Grove Citizens' Police Academy Alumni for big local events, such as presidential visits. So, what do you get out of volunteering?

A: (Ellen pipes in) It's the right thing to do. I came out of the Blitz (in World War II London) and there was this tremendous feeling of: we're all in this together. If there's a disaster it won't be a question of who has more money or is pretty. We'd better all help each other. When people talk about 9/11, I say, 'Get real!' We had that (bombing) every night for months. The last blitz lasted two years.

Q: Any parting comments to allay our free-floating fears?

A: My advice is for people to take the Citizen's Emergency Response Team training course (CERT). You can call your local fire department for details.

Russell C. Coile retires from Sand City Police Dept!

Farewell Ceremony (BBQ) on October 15 at noon in Sand City City Hall Chambers.

PROCLAMATION

BY THE MAYOR OF THE CITY OF SAND CITY RECOGNIZING DR.RUSSELL C. COILE, Ph.D, P.E., FICDDS DISASTER PREPAREDNESS COORDINATOR FOR HIS VOLUNTEER SERVICES TO THE CITY OF SAND CITY

WHEREAS, Russell C. Coile has served as a volunteer for the City of Sand City Police Department since May 2003 as Sand City's Disaster Preparedness Coordinator; and

WHEREAS, Russell C. Coile is a Certified Emergency Manager in the Field of Disaster Preparedness and Management, giving lectures and talks at International Emergency Management Conferences through the United States and abroad; and

WHEREAS, upon graduation from college, Russell C. Coile was commissioned as a Second Lieutenant in he U.S. Army Signal Corps Reserve, received Reserve Officer training in high school and college; and is a retired Colonel of the U.S. Air Force; and

WHEREAS, Russell C. Coile holds an S.B., S.M., and E.E. degrees in Electrical Engineering from the Massachusetts Institute of Technology, Cambridge; a Ph.D in Information Science from The City University, London, England, and as an Air War College graduate from Maxwell Air Force Base, Alabama; and

WHEREAS, his military experience involved operations research working for several universities which had Office of Naval Research grants to design and evaluate exercises for the Navy, Marine Corps, and Army; assisted in research on the design of emergency operating centers, and participated in training exercises at various Air Force and Navy Headquarters in the United States, Japan and England; and

WHEREAS, as a community activist, Russell C. Coile served as Co-Chairman of the TRI-County Community Disaster Preparedness Committee,

member of the Board of Directors of the Northern California Disaster Preparedness network, and Amateur Radio communications volunteers at KRM6KL, Carmel-by-the-Sea Chapter; and

WHEREAS, Russell C. Coile has authored several disaster response and preparedness papers along with holding presentations such as Lessons from Disasters; What Policy Leaders Need to Know, July 2004; Citizen Corps Volunteers to Prepare for and Respond to Terrorism and Natural Disasters. May, 2002; Pacific Grove Fire Department's Public Education and Professional Outreach programs for Disaster Preparedness, November 1999; Partnership for Preparedness Against Terrorism, October 1998; and Emergency Management in the United States, June 1995; and

WHEREAS, Russell C. Coile is a devoted husband to Ellen, a loving father, and presently resides in Pacific Grove California.

NOW,THEREFORE, it is hereby proclaimed by David K Pendergrass, Mayor of the City of Sand City recognizing Dr. Russell C. Coile for his educational accomplishments, career endeavors and service to the community.

Proclaimed and signed by he Mayor of the City of Sand City on this 15th day of October, 2009.

David K. Pendergrass, Mayor

SEAL OF THE CITY OF SAND CITY

Sand City Emergency Operations Plan

Program Administration

Executive policy

Sand City is a unique city. It was incorporated in May 1960. The 347 acres in the city include a coastline of approximately 1.5 miles. According to the U.S. Census for 2000, the resident population was 261 persons. There is a Mayor and four council members and 20 employees to support this population consisting of a City Administrator with 5 City Hall employees, a Police Chief, with records administrator and 9 police officers, and 3 Public Works employees. The Monterey Fire Department provides firefighting response under contract. Because Sand City is a regional shopping center with a number of industries, the daytime number of shoppers, industrial and business employees in Sand City has been estimated to be between 10,000 and 50,000. The Sand City Emergency Operations Plan describes the City's emergency organization, policies and procedures. The plan also addresses integration and coordination with other governmental agencies when required.

Goals and objectives

The goal of the emergency program is to provide a safe environment before, during and after any emergency for residents of Sand City as well as for workers, shoppers, and visitors to Sand City. The objectives are to prepare for any type of natural or man-made disaster, respond appropriately in the event of a disaster, recover at soon as possible and take mitigation actions to reduce the impact of local hazards in the future.

Plans and procedures

The plan addresses how Sand City will respond to extraordinary events or disasters, from preparedness through response, recovery and mitigation. The responsibilities of each department are identified, based on each identified hazard or threat examined in Sand City's hazard analysis and probability matrix. Standard Operating Procedures (SOPs) are discussed, including roles and responsibilities.

Authorities, legislation, and regulations

This plan is based on the functions and principles of the National Incident Management System (NIMS) as described in Homeland Security Presidential Directive HSPD-5. NIMS will supersede California's Standardized Emergency Management System (SEMS) by FY 2007.

Budget, schedules, and milestones

The City's Office of Emergency Services is responsible for both preparing the plan and submitting a proposed budget at the appropriate time. It will review the entire plan after any incident and on an annual basis to coordinate any revisions of the plan as required. The Sand City Emergency Operations Plan will be approved by the City Council and signed by the Mayor.

Advisory committee and evaluation

Routine day-to-day emergency matters will be handled by the Sand City Police Chief. There will be a Citizens' Advisory Committee composed of representatives of Sand City residents, businesses, and non-governmental organizations such as the Salvation Army to provide suggested input to the City Administrator on emergency matters. An evaluation of Sand City's readiness will be conducted after each incident to determine if corrective actions might be appropriate.

1. General

Mitigation

Each city in California is required to prepare a 'Local Hazard Mitigation Plan' which must be submitted through the State of California to be reviewed and approved by the Federal Emergency Management Agency in the Department of Homeland Security. Monterey County has hired a consultant, URS to prepare a countywide hazard mitigation plan. On 19 July 2005, Sand City approved a resolution to participate in this regional local hazard mitigation planning effort and provide a fair share of the County's expense. Sand City will then modify this basic template to consider hazards and mitigation actions appropriate to Sand City. It is expected that Sand City's Local Hazard Mitigation Plan should be completed in 2006.

Preparedness

Sand City's Response to disasters is based on the NIMS phases of:
Mitigation;

Preparedness;
Response; and
Recovery operations.

During each phase, specific actions are taken to reduce and/or eliminate the threat of specific disaster situations. In coordination with the Incident Commander, the Sand City Director of Emergency Services (City Administrator) will determine the phase and initiate the appropriate level of alert for response agencies, including the activation of the Sand City Emergency Operations Center as required.

Increased readiness

Upon receipt of a warning or the observation that an emergency situation is imminent or likely to occur soon, Sand City may initiate actions to increase its readiness. Events which may trigger increased readiness activities include: receipt of a special weather advisory from the National Weather Service; conditions conducive to large scale urban fires, such as the combination of high heat, strong winds, and low humidity; a hazardous materials incident; and information or circumstances indicating the potential for terrorism, acts of violence or civil disturbance. Increased readiness activities may include, but are not limited to, the following activities: briefing key officials and employees of Sand City on the situation; increasing public information efforts; inspecting critical facilities and equipment; recruiting additional staff and volunteer Disaster Service Workers; warning threatened elements of the Sand City population; conducting precautionary evacuations in potentially impacted areas; mobilizing personnel and pre-positioning resources and equipment; and establishing or activating staging areas.

Initial response Sand City's initial response activities are primarily performed at the field response level. Emphasis is placed on minimizing the effects of the emergency or disaster. Field responders will use the NIMS Incident Command System (ICS) to organize response to the emergency or disaster, incorporating the functions, principles and components of ICS (i.e., unified command, action planning, span of control, hierarchy of command, etc.). The role of the Sand City Emergency Operations Center is coordination of information and resources to support the Incident Commander in the field who is in charge of actual response activities.

Examples of initial response activities include: making all necessary notifications, including the Monterey County Operational Area; proclaiming a local emergency in Sand City; disseminating of warnings, emergency

public information, and instructions to the residents, workers, shoppers, and visitors in Sand City; conducting evacuations and/or rescue operations; caring for displaced persons and treating the injured; conducting initial damage assessments and surveys; assessing need for mutual aid assistance; restricting movement of traffic/people and unnecessary access to affected areas; coordinating information and resources with Operational Area, State and Federal agencies.

Extended Response

Sand City's extended response activities are conducted in the field and in the City's emergency operations center (EOC). The Sand City EOC is located in the council chambers of City Hall. In case of earthquake or other damage to the City Hall, an alternate EOC win be activated in the Public Works trailer in the City's Corporation Yard across the street from City Hall. If the Corporation yard is moved in the future, the alternate EOC may be located in this new location.

Extended emergency operations involve the coordination and management of personnel and resources to mitigate an emergency and facilitate the transition to recovery operations. Field response personnel will use the NIMS Incident Command System to manage field operations.

EOC staff will be organized to coordinate information and resources to support the Incident Commander in the field. The components and principles of NIMS will be used by the EOC staff. EOC staff will keep in communication with the incident commander in the field to obtain his incident action plan and measurable and attainable objectives to be achieved for each given operational period.

When the Sand City EOC is activated, communications and coordination will be established between the Incident Commander(s) in the field and the EOC. Communications and coordination will be established between the Sand City EOC, when activated, and the Monterey County Operational Area EOC. The State of California is installing the 'E-Team' modernization of California's Response Information Management System (RIM:S). NIMS multi-agency or inter-agency coordination will be used by EOC staff to facilitate decisions for overall local government level emergency response activities.

NIMS Mutual Aid System allows for the progressive mobilization of resources to/from emergency response agencies, local governments,

operational areas, regions, and the State with the intent of providing adequate resources to requesting agencies.

Within the framework of the SEMS California Disaster and Civil Defense Master Mutual Aid Agreement, in the future all requests for assistance will be submitted using appropriate resource request procedures of the E-Team Response Information Management System. The jurisdiction requesting mutual aid will remain in charge and retain overall direction of personnel and equipment provided through mutual aid.

Examples of extended response activities include: preparing detailed damage assessments; operating mass care facilities; coordinating coroner operations; procuring resources to sustain operations; documenting situation status; protecting, controlling, and allocating vital resources; restoring vital utility services; tracking resource allocations; conducting advanced planning activities; documenting expenditures; developing and implementing Action Plans for extended operations; dissemination of emergency public information; prioritizing resource allocation.

Recovery

As the immediate threat to life, property, and the environment subsides, the rebuilding of Sand City will begin through various recovery activities.

Recovery activities involve the restoration of services to the public and rebuilding affected areas. Recovery activities may be both short-term and long-term, ranging from restoration of essential utilities such as water and power, to mitigation measures designed to prevent future occurrences of a given threat facing Sand City.

The Sand City Recovery identifies details of Sand City's recovery operations. In addition, the Monterey Operational Area Emergency Plan covers the recovery process in detail, describing roles and responsibilities and the procedures for accessing the federal and state disaster assistance programs which would be available for individuals, businesses, and the city of Sand City.

Examples of Sand City Recovery Plan activities include: restoring of all utilities; establishing and staffing Local Assistance Centers and Disaster Assistance Centers; applying for state and federal assistance programs; conducting hazard mitigation analyses; identifying residual hazards; and determining and recovering costs associated with response and recovery.

Responsibilities of Sand City

Sand City is responsible for preparedness, response, recovery and mitigation for disasters within its jurisdiction. Sand City will use the E-Team Response Information Management System (RIMS) to document the overall emergency response and recovery activities within its jurisdiction. During disasters, Sand City is required to communicate and coordinate emergency operations with the Monterey County Operational Area and, in some instances, other local governments.

Under the National Incident Management System, the city has responsibilities at two levels: the field response and local government levels. At the field response level, all agencies will use the NIMS Incident Command System to standardize the emergency response.

At the local government level, the Sand City Emergency Operations Center is used as the central location for coordination of information and resources with the Monterey County Operational Area by using the E Team Response Information Management System (RIMS).

2. Authorities and References

The authority for the Sand City Emergency Operations Plan is provided in the California Emergency Services Act (Chapter 7 of Division 1 of Title 2 of the Government Code.

Homeland Security Act 2002

Homeland Security Presidential Directive / HSPD-5 Management of Domestic Incidents, February 28,2003

Sand City resolution number xxxx provides the authority for implementing the Sand City Emergency Operations Plan and Sand City's adoption of the National Incident Management System.

Monterey County Operational Area Emergency Operations Plan

National Incident Management System, March 1, 2005

Standardized Emergency Management System regulations (California Government Code 8607),

National Fire Protection Association NFP A 1600 Standard on Disaster/ Emergency Management and Business Continuity Programs 2004 Edition

Chapter 2.12 Emergency Organization of the Sand City Municipal Code outlines the basis of emergency management in Sand City.

2.12.010 Purposes

The declared purposes of this chapter are to provide for the preparation and carrying out of plans for the protection of persons and property within this city in the event of an emergency, the direction of the emergency

organization, and the coordination of the emergency functions of this city with all other public agencies, corporations, organizations and affected private persons.

2.12.020 Definition

As used in this chapter, 'emergency' means the actual or threatened existence of conditions of disaster or of extreme peril to the safety of persons and property within this city caused by such conditions as earthquake, fire, flood, tsunami, storm, epidemic, or riot, or other conditions, including conditions resulting from war or imminent threat of war, but other than conditions resulting from a labor controversy, which conditions are or are likely to be beyond the control of the services, personnel, equipment and facilities of this city, requiring the combined forces of other political subdivisions to combat.

2.12.030 National Incident Management System and Standardized Emergency Management System

The city has agreed to adopt and use the National Incident Management System and California's Standardized Emergency Management System in accordance with California Code of Regulations, Title 19, Section 2407. The City will be eligible for state funding of response-related personnel costs pursuant to activities identified in California Code of Regulations, Title 19, Sections 2920, 2925, and 2930

2.12.040 Operational Area

The city of Sand City has agreed to participate in the Monterey County operational area emergency management organization. This is a partnership for exchanging disaster intelligence information, mutual aid and resource requests in emergencies, and for strengthening emergency preparedness through cooperative training and exercise activities. The Monterey County operational area will also serve as the coordination and communications link between the city of Sand City and the State of California, Office of Emergency Services, Coastal Region. The city of Sand City will communicate with the Operational Area by using the E- Team Response Information Management System (RIMS) for making required reports and submitting requests for resources.

2.12.050 Disaster Council

The Sand City disaster council is created and shall consist of the following: The City Administrator, who shall be chairperson; The Police Chief, who shall be vice-chairperson; City department heads who have emergency

responsibilities as are provided for in emergency plan of the city; Such representatives of civic, business, labor, veterans, professional or other organizations having an emergency responsibility, as may be appointed by the director with the advice and consent of the city council.

2.12.060 Duties of Disaster Council

It shall be the duty of the members of the Sand City disaster council to support the city's disaster activities of preparedness, response, recovery, and mitigation, including participating in training, exercises, and disasters, as feasible. The disaster council shall meet upon call of the chairperson or, in his or her absence from the city or inability to call such meeting, upon call of the vice-chairperson.

2.12.070 Office of Emergency Services

There is created the office of emergency services. This office shall develop and maintain the emergency operations plan for the city in accordance with the state's Standardized Emergency Management System, as well as a training program for city staff covering their responsibilities under the Sand City Emergency Plan. The City Administrator shall be the director of the office of emergency services, and the Police Chief shall be the assistant director of the office of emergency services. The Police Chief also shall be responsible for day-to-day operation of the office of emergency services.

2.12.080 Duties of the director and assistant director

(a) The director is empowered to:

(1) Request Sand City City Council to proclaim the existence or threatened existence of a 'local emergency' if the city council is in session, or to issue such proclamation if the city council is not in session. Whenever a local emergency is proclaimed by the director, the city council shall take action to ratify the proclamation within seven days thereafter or the proclamation shall have no further force or effect;

(2) Request the Monterey County Operational Area to request the Governor to proclaim a 'state of emergency' when, in the opinion of the director, the locally available resources are inadequate to cope with the emergency;

(3) Control and direct the effort of the emergency organization of this city for the accomplishment of the purposes of this chapter;

(4) Direct cooperation between and coordination of services and staff of the emergency organization of this city, and resolve questions of authority and responsibility that may arise between them;

(5) Represent this city in all dealings with public or private agencies on matters pertaining to emergencies as defined herein;

(6) In the event of the proclamation of a 'local emergency' as herein provided, the proclamation of a 'state of emergency' by the Governor or the Director of the State Office of Emergency Services, or the existence of a 'state of war emergency,' the director is empowered: (A) To make and issue rules and regulations on matters reasonably related to the protection of life and property as affected by such emergency; provided, however, such rules and regulations must be confirmed at the earliest practicable time by the city council; (B) To obtain vital supplies, equipment, and such other properties found lacking and needed for the protection of life and property and to bind the city for the fair value thereof and, if required immediately, to commandeer the same for public use; (C) To require emergency services of any city officer or employee and, in the event of the proclamation of a 'state of emergency' in the county in which this city is located or the existence of a 'state of war emergency,' to command the aid of as many citizens of this community as he or she deems necessary in the execution of his or her duties; such persons shall be entitled to all privileges, benefits, and immunities as are provided by state law for registered disaster services workers; (D) To requisition necessary personnel or material of any city department or agency; (E) To execute all of the ordinary power of the city administrator, all of the special powers conferred upon him or her by this chapter or by resolution or emergency plan pursuant hereto adopted by the city council, all powers conferred upon him or her by any statute, by any agreement approved by the city council, and by any other lawful authority.

(b) The director of emergency services shall designate the order of succession to that office, to take effect in the event the director is unavailable to attend meetings and otherwise perform his or her duties during an emergency. Such order of succession shall be approved by the city council.

© The assistant director shall be first in order of succession, and shall have such other powers and duties as may be assigned by the director including everyday direction, supervision, and administration of the city's total emergency services program.

2.12.090 Emergency Organization

All officers and employees of this city, together with those volunteer forces enrolled to aid them during an emergency, and all groups,

organizations, and persons who may by agreement or operation of law, including persons impressed into service under the provisions of Section 3.20.080 of this chapter, charged with duties incident to the protection of life and property in this city during such emergency, shall constitute the emergency organization of the city of Sand City.

2.12.100 Emergency Plan

The Office of Emergency Services shall be responsible for the development of the city of Sand City Emergency Plan, which plan shall provide for the effective mobilization of all of the resources of this city, both public and private, to meet any condition constituting a local emergency, state of emergency, or state of war emergency; and shall provide for the organization, powers and duties, services, and staff of the emergency organizations. Such plan shall take effect upon adoption by resolution of the city council.

2.12.110 Expenditures

Any expenditures made in connection with emergency activities, including mutual aid activities, shall be deemed conclusively to be for the direct protection and benefit of the inhabitants and property of the city of Sand City.

2.12.120 Punishment of violations

It shall be a misdemeanor, punishable by fine of not to exceed $500 or by imprisonment for not to exceed six months, or both, for any person, during an emergency, to: (a) Willfully obstruct, hinder, or delay any member of the emergency organization in the enforcement of any lawful rule or regulation issued pursuant to this ordinance, or in the performance of any duty imposed upon him or her by virtue of this ordinance. (b) Do any act forbidden by any lawful rule or regulation issued pursuant to this ordinance, if such act is of such a nature as to give or be likely to give assistance to the enemy or to imperil the lives or property of inhabitants of Sand City, or to prevent, hinder, or delay the defense or protection thereof. (c) Wear, carry, or display, without authority, any means of identification specified by the emergency agency of the state.

2.12.130 Severability

If any provision of this ordinance or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications, and to this end the provisions of this ordinance are declared to be severable.

3. Hazard Identification, Risk Assessment, and Impact Analysis

The City of Sand City recognizes that the planning process must address each hazard that threatens Sand City. Sand City is vulnerable to several categories of hazards: natural, technological/man-made, and national security/terrorism. Sand City's Local Hazard Mitigation Plan will identify possible hazards, make risk assessments, analyze impacts and prioritize and recommend appropriate mitigation activities.

Earthquakes - The Loma Prieta 6.9 magnitude earthquake in 1989 caused minor damage to infrastructure and unreinforced masonry buildings in Sand City. However, in planning for future events, the U.S Geological Survey estimated in April 2003 that there will be a 62% probability of a 6.7 magnitude earthquake within the next 30 years in the San Francisco Bay area. According to the USGS, 'Residents living near the Pacific coast in San Mateo, Santa Cruz, and Monterey counties are sandwiched between the San Andreas and San Gregorio faults. These two faults have a combined 34% chance of producing one or more magnitude 6.7 or greater quakes in these coastal areas before 2032.'

Tsunamis - After the 1964 offshore earthquake in Alaska, a seismic wave was generated. The tsunami caused very little damage to the Sand City coastal area, but struck Crescent City shortly after midnight after 6 hours of travel time. Crescent City, California suffered severe damage to its business district and 11 people were killed. The USGS tsunami warning system will provide timely warning to California coastal cities of tsunamis caused by earthquakes in Alaska or Japan. In the future, however, a strong offshore earthquake along the San Gregorio fault (the Cascadia subduction zone) has the potential of creating a significant tsunami at Sand City with very little alerting warning time.

Winter storms - In 1993 severe winter storms caused waters from the Salinas River to overflow its banks and flood surrounding areas. In 2001 there was flooding damage in Sand City because of City of Seaside's blocked storm drains. Seaside Public Works has been requested by the City of Sand City to correct this problem. Seaside is planning to install a one-way valve system and is attempting to obtain a grant to install this.

Hazardous Materials - In the past several years, the threat from hazardous materials in Sand City has increased. The threat for Sand City is complicated by the increased use and storage of hazardous materials in manufacturing facilities in Sand City.

Natural and Technological Hazards - Sand City, with its varying topography, growing permanent population, and growing shopping, industrial and recreational population is subject to a wide variety of possible harmful events from natural and technological hazards. The natural hazards and technological or man-made hazards that confront the City of Sand City are as follows: *Natural Hazards:* Earthquakes; floods; wild land fires; landslides; extreme weather/storm; and tsunami. *Technological/Man-made Hazards:* hazardous materials; major vehicle accident; airplane crash; civil disturbance; and terrorism.

A hazard matrix that outlines each of these hazards and identifies their likelihood of occurrence and its severity is as follows:

Likelihood of Occurrence in Sand City and Severity

Water Supply Failure: infrequent/low severity; Earthquake (M less than 5.0): infrequent/low severity; Earthquake (M greater than 5.0): infrequent/high severity; Fire: infrequent/moderate severity; Floods: infrequent/low severity; HazMat: infrequent/moderate severity; Landslides: infrequent/low severity; Civil Disturbance: infrequent/low severity; Extreme Weather/Storm: sometimes/low severity; Aircraft Crash: infrequent/low severity; Power Failure: infrequent/high severity; Major Vehicle Accident: infrequent/low severity; Terrorism: infrequent/moderate severity; Tsunami: infrequent/low severity.

Impact Analysis

The matrix above showed both the likelihood of occurrence and the estimates of low, moderate, or high severity for each hazard. These estimates are based on the potential for the detrimental impacts of the hazards on: (1) Health and safety of persons in the area at the time (injury or death) (2) Health and safety of first responders (3) Continuity of operations (4) Damage to property, facilities, and infrastructure (5) Delivery of services (6) The environment (7) Economic and financial conditions

ORGANIZATIONAL ROLES, AND RESPONSIBILITIES

Sand City departments have specific responsibilities and related activities/actions assigned to them for each identified hazard and threat. Each department is responsible for ensuring coordination with the other departments. Each department will be responsible for identifying key departmental personnel with backups and alternates for each position.

The Sand City Office of Emergency Services is responsible for developing and maintaining an emergency alert list, which will be used to notify key

city personnel. Each department will develop their own departmental alert list, which will be used by the departments to alert departmental personnel. The Sand City Office of Emergency Services has overall responsibility for coordinating the City's response to each identified hazard and threat. Departmental responsibilities are outlined in hazard/threat specific matrices. Typical activities/actions performed during a specific hazard/threat are listed on the vertical axis (y-axis); and the five NIMS/SEMS functions are listed on the horizontal axis (x-axis). For each activity/action, the departments' assigned responsibilities under this activity/action are listed under the appropriate NIMS/SEMS function.

4. Hazard Mitigation

Sand City will prepare a Local Hazard Mitigation Plan in accord with new requirements from the Department of Homeland Security. Monterey County has given a contract to a consulting firm to prepare an overall hazard mitigation plan template suitable for all twelve cities in the county. Sand City is participating in this project and contributing its fair share of funding. Each city must then add local material appropriate to its location. It is expected that the Sand City Local Hazard Mitigation Plan will be completed and submitted to FEMA in 2006.

The City of Sand City's local hazard mitigation plan will be based on hazard identification, risk assessment, impact analysis, historical experiences, program assessment and cost-benefit analyses. Some of the mitigation strategies may be as follows: 1. Applicable building construction standards; 2. Appropriate land-use practices; 3. Relocation of structures at risk; 4. Elimination of the hazard; 5. Reduction of the size of the hazard; 6. Segregation of the hazard; 7. Modification of the hazard; 8. Establishment of hazard warning systems and procedures; 9. Redundancy of personnel, systems, equipment, or materials.

5. Resource Management

The underlying concepts of resource management in this context are that: there will be a uniform method of identifying, acquiring, allocating, and tracking resources; it uses effective mutual-aid and donor assistance, and is enabled by the standardized classification of kinds and types of resources required to support the incident management organization; it uses a credentialing system tied to uniform training and certification standards to ensure that requested personnel resources are successfully integrated

into ongoing incident operations; the coordination is the responsibility of the Sand City Emergency Operations Center using the E-Team Response Information Management System software to request resources and keep track of them; it should also encompass resources contributed by private sector and nongovernmental organizations.

Sand City has implemented and institutionalized processes, systems, procedures, and/or plans to address the underlying concepts of resource management using E-Team RIMS software, including: a uniform method of identifying, acquiring, allocating, and tracking resources; effective mutual-aid and donor assistance; standardized classification of kinds and types of resources required to support the incident management organization; a credentialing system tied to uniform training and certification standards; coordination, which is the responsibility of emergency operations centers; use of resources contributed by private sector and non-governmental organizations.

7. Planning

Sand City's overall emergency program will include a strategic plan, an emergency operations plan, a mitigation plan, a recovery plan, and a continuity of government plan.

Sand City's strategic plan

This essence of Sand City's strategic plan was presented earlier in this document in the section labeled Program Administration which defined the vision, mission, goals, and objectives of the emergency program.

Sand City's emergency operations plan

Sand City's emergency operations plan (EOP) defines the scope of preparedness and incident management activities necessary for our city. The EOP describes organizational structures, roles and responsibilities, policies, and protocols for providing emergency support. The EOP facilitates response and short-term recovery activities which set the stage for successful long-term recovery. It will drive decisions on long-term prevention and mitigation efforts or risk-based preparedness measures directed at specific hazards. The EOP is flexible enough for use in all emergencies. The EOP describes the purpose of the plan, situation and assumptions, concept of operations, organization and assignment of responsibilities, administration and logistics, plan development and maintenance, and authorities and references. It also contains functional annexes and hazard-

specific appendices. The EOP includes pre-incident and post-incident public awareness, education, and communications plans and protocols.

Sand City's Mitigation Plan

Sand City's local hazard mitigation plan will be developed in conjunction with Monterey County's contract with a consulting firm to prepare the county-wide template for mitigation plans. Sand City will then modify the template to add specific Sand City hazards and appropriate mitigation actions. It is expected that Sand City's local hazard mitigation plan will be completed and submitted to FEMA as a separate document in 2006.

Sand City's Recovery Plan

Sand City will be involved in recovery operations as described in Appendix B. In the aftermath of a disaster, many citizens will have specific needs that must be met before they can pick up the thread of their pre-disaster lives. Typically, there will be a need for such services as these: assessment of the extent and severity of damages to homes and other property; restoration of services generally available in communities - water, food, and medical assistance; repair of damaged homes and property; and professional counseling.

When the sudden changes resulting from the emergency have resulted in mental anguish and inability to cope, the City will help individuals and families recover by ensuring that these services are available and by seeking additional resources for the community.

Recovery occurs in two phases: short-term and long-term. Short-term recovery operations will begin during the response phase of the emergency. The major objectives of short-term recovery operations include rapid debris removal and clean-up, and orderly and coordinated restoration of essential services (electricity, water, and sanitary systems). Short-term recovery operations will include all the agencies participating in the City's disaster response. The major objectives of long-term recovery operations include: coordinated delivery of long-term social and health services; improved land use planning; improving the Sand City Emergency Operations Plan; re-establishing the local economy to pre-disaster levels; recovery of disaster response costs; and the effective integration of mitigation strategies into recovery planning and operations.

The City of Sand City will handle long-term recovery activities. Changes to the Recovery Plan will be coordinated with all participating departments

and agencies. Structures that present public safety threats will be demolished during short-term recovery operations.

The goal of short-term recovery is to restore local government services to at least minimal capacity. Short-term recovery includes: utility restoration; expanded social, medical and mental health services; re-establishment of Sand City government operations; transportation route restoration; debris removal and clean-up operations; and demolition of hazardous structures.

Sand City will coordinate with private utility companies on all efforts to restore utility systems and services during recovery operations. Monterey County Health Department will be requested to coordinate and conduct critical stress debriefings for emergency response personnel and victims of the disaster/event.

For federally declared disasters, tele-registration centers may be established by the Department of Homeland Security's Federal Emergency Management Agency (FEMA) to assist disaster victims and businesses in applying for individual assistance grants and Small Business Administration loans.

In coordination with the American Red Cross, the City will provide sheltering for disaster victims until housing can be arranged.

The City will ensure that debris removal and clean-up operations are expedited during short-term recovery operations.

The goal of long-term recovery is to restore facilities to pre-disaster condition. Long-term recovery includes hazard mitigation activities, restoration and reconstruction of public facilities, and disaster response cost recovery.

The City will be responsible for its own approach to mitigation which could include zoning variances, building code changes, plan reviews, seismic safety elements, and other land use planning techniques. With public safety a primary concern, rapid recovery may require adjustments to policies and procedures to streamline the recovery process.

Hazard mitigation actions will need to be coordinated and employed in all activities by the City and special districts in order to ensure a maximum reduction of vulnerability to future disasters. The City and special districts will strive to restore essential facilities to their pre-disaster condition by retrofitting, repairing or reconstructing them during long-term recovery operations.

Recovery programs will also be sought for individual citizens.

Sand City's Continuity of Government Plan

Normal operations of the City of Sand City may be completely disrupted in a catastrophic disaster such as an earthquake when there may be no commercial electricity, telephone systems are not working, streets and overpasses are damaged, water, sewer, and gas pipes have been broken, etc. The City's continuity of government plan identifies critical items, vital records, the City's processes and functions which shall be maintained, as well as the personnel and procedures necessary to do this while the City's capabilities are being restored.

8. Direction, Control, And Coordination

The City of Sand City has developed the capability to direct, control, and coordinate response and recovery operations in accord with the procedures outlined in the National Incident Management System. Specific organizational roles, titles, and responsibilities for each incident management function will be identified and discussed in this section. The E-Team Response Information Management System will be used to communicate with the Monterey County Operational Area for coordinating response, continuity and recovery activities.

For the Sand City's Emergency Operations Plan to be complete, each EOC section, branch and unit must have Standard Operating Procedures (SOPs). These SOPs will contain those actions that are necessary to fulfill the NIMS/SEMS functional responsibilities under this plan. Each of the SOPs will include generic information such as increased readiness activities, procedures for recalling departmental personnel, disaster assignments, and resource lists.

Under a heading for each NIMS/SEMS section, branch or unit, a descriptive list of what specific information will be in the SOPs is provided below. Strict adherence to the guidelines of the SOP by departments is not required. Departments may find it necessary to deviate from SOPs to respond to unique needs in a particular response.

Responsibilities of Sand City Director of Emergency Services (City Administrator)

Approve location of alternate Sand City Emergency Operations Center, if necessary because of damage to City Hall.

Prepare public information releases for staff, residents, workers, shoppers, visitors in Sand City and the media with assistance from the Office of Emergency Services.

Prepare to recruit volunteers and additional staff, including the procedure for registering them as Disaster Service Workers with assistance from the Office of Emergency Services.

Develop procedures to disseminate warnings, emergency public information, and instructions to Sand City employees, residents, workers, shoppers, and visitors with assistance from the Police Department, Fire Department representative, and the Office of Emergency Services.

Develop a draft of the declaration of a local emergency for transmittal to the Monterey Operational Area in Salinas with assistance from the Office of Emergency Services and the City's attorney.

Use the new ETeam Response Information Management System procedures for requesting, controlling, and allocating vital resources.

Develop the process for communicating with the City's Disaster Council and briefing them with updated information as feasible.

Develop the procedures and processes used for recovery operations with assistance from the Finance Department and the Office of Emergency Services.

Develop procedures for continuing government operations, including the approval of alternate sites and succession of City leadership.

Responsibilities of Sand City Office of Emergency Services

Check and test communications systems in the Emergency Operations Center and if necessary in the alternate EOC.

Prepare to brief the Mayor, and Sand City employees if there is any advance warning of an impending disaster situation.

Draft a local emergency declaration for sending by E-Team Response Information Management System to the Monterey Operational Area for transmittal to the Coastal Region of the Governor's Office of Emergency Services.

Coordinate with Mayor's Office in preparation of possible public information press releases of impending disaster situations.

Coordinate with Mayor's Office, the possible recruitment of volunteers and additional staff, including the procedures for registering them as Disaster Service Workers.

Activate the process for managing incidents at the field level, using the National Incident Management System's Incident Command System with assistance of the Sand City Police Department and the Monterey Fire Department representative.

Develop procedures to disseminate warnings, emergency public information, and instructions to Sand City residents, businesses, shoppers and visitors with assistance from the Sand City Police Department, Monterey Fire Department representative and the Mayor and council members of Sand City.

Develop the procedures for maintaining normal operations during the local emergency status for an extended period of time if necessary.

Develop the process and procedure for responding to media inquiries for the duration of the emergency.

Develop procedures for the deactivation of the Sand City Emergency Operations Center. Develop procedures for the organization and preparation of after-action reports.

Develop the procedures and processes used for recovery operations with assistance from the Finance Department and Community Development Department.

Develop procedures for applying for state and federal disaster assistance programs.

Identify the process for conducting and analyzing potential hazard mitigation projects in coordination with the Public Works and Community Development Departments.

Responsibilities of Sand City Police Department

Develop procedures for checking critical Sand City police department facilities and equipment, including testing communications systems.

Develop procedures for mobilizing Police Department personnel and pre-positioning resources and equipment.

Identify alternative Emergency Operations Center facilities to the City Administrator (Director of Emergency Services), in case of damage to the primary Emergency Operations Center

Develop procedures for incident management in the field using the National Incident Management System's Incident Command System with assistance of the Monterey Fire Department representative and the Sand City Office of Emergency Services.

Develop procedures to disseminate warnings, emergency public information, and instructions to Sand City employees, residents, workers, shoppers, and visitors with assistance of the Monterey Fire Department representative and the Sand City Office of Emergency Services

Develop procedures for responding to: aircraft accidents, including military aircraft; major vehicle accidents; terrorism incidents hazardous material incidents; civil disturbances; earthquakes; floods; urban fires; landslides; and extreme weather or storm situations.

Develop procedures for initiating: 'windshield survey' damage assessments following an earthquake; perimeter management, including access control; isolating the incident, and controlling access to the incident; request for law enforcement mutual aid; and operations to safeguard evidence at hazmat and terrorism incidents.

Develop procedures for evacuation/movement operations and traffic and crowd control operations, including the identification of evacuation routes, evacuation reception areas, shelter locations, and security for area.

Plan for special traffic control, restricted access and access control for specific areas involved in hazardous material incidents.

Ensure that the requirements under the Americans with Disabilities Act are included in evacuations and movement operations.

Develop communication and coordination protocols between the Sand City Police operations in the field and the Sand City Emergency operations Center.

Develop procedures in coordination with the Monterey County Coroner for managing fatalities until the Coroner arrives.

Responsibilities of Fire Department (Contracted to Monterey Fire Department)

A detachment of Monterey Fire Department personnel and equipment will report to the Sand City Incident Commander to conduct fire and rescue operations in Sand City in emergency situations in accordance with the existing contract between the City of Sand City and the City of Monterey.

Management of incidents at the field level will conform to the National Incident Management System's Incident Command System (ICS) with coordination between Monterey Fire Department personnel and the Sand City Police Department.

Hazardous material procedures in Sand City will be consistent with the Monterey County's Hazardous Materials Plan with support by Seaside's Hazmat team.

Assigned Monterey Fire Department personnel will assist, as feasible, in dissemination of warnings, emergency public information, and instructions to Sand City employees, residents, workers, shoppers and visitors in fire disasters in coordination with the Sand City Police Department.

Assigned Monterey Fire Department personnel will assist Sand City Police, as feasible, in responding to and managing: aircraft accidents, including military aircraft; major vehicle accidents; terrorism incidents; earthquakes; floods; urban fires; landslides; and extreme weather or storm situations.

Assigned Monterey Fire Department personnel will assist Sand City Police as feasible in responding to and managing: activities to implement Incident Action Plans; 'windshield survey' damage assessments following an earthquake; medical operations, including triage operations; needs assessment and subsequent requests for fire and rescue mutual aid; rescue operations evacuation operations; treatment of injured.

Responsibilities of Sand City Public Works Department

Identify the process and develop procedures for checking critical Public Works facilities and equipment, including testing all systems.

Develop procedure for mobilizing Public Works personnel and pre-positioning resources and equipment.

Develop procedures for Public Works response to: terrorist incidents; earthquakes; floods; landslides; and extreme weather or storm situations.

Develop procedures for initiating: damage assessment of utilities after an earthquake; damage assessment of homes, businesses and industrial facilities; damage assessment of critical infrastructure facilities; debris removal operations; repair and restoration activities for damaged facilities, utility systems, and infrastructure; flood fighting activities/actions; sand bagging operations; hazardous waste clean up and disposal operations; clearing and shoring operations for landslide areas; and request for public works mutual aid.

Develop procedures for assisting in restoring vital utility services.

Conduct and analyze potential hazard mitigation projects to assist the Sand City Office of Emergency Services and Community Development Department.

Community Development Department

Develop procedures for mobilizing Community Development Department personnel and pre-positioning resources and equipment.

Develop procedures for assessing mutual aid needs for damage assessment.

Develop procedures for performing detailed safety inspections of damaged facilities following an earthquake, including the process of determining whether a structure will be rebuilt or demolished.

Develop procedures to initiate mutual aid request for building inspectors following an earthquake.

Develop procedures to manage building inspection teams. Develop procedures for conducting advance planning activities.

Develop procedures for creating a situation status report for the disaster to obtain the 'big picture,' including the updating process.

Develop procedures for tracking resources.

Finance Department

Develop procedures for procuring emergency resources to sustain operations.

Develop the disaster accounting system for documenting the financial cost of disaster response and recovery operations.

Develop the procedures and processes used for recovery operations with assistance of the Office of Emergency Services and the Administration,

Develop the process and procedures for tracking employees' time and issuing paychecks during disaster operations.

Develop process and the procedures for submitting and processing workman compensation claims.

9. Communications And Warning

The City of Sand City has established communications systems and procedures, and regularly tests them to support the City's emergency program. The systems have a reliable capacity to notify officials and alert emergency response personnel. Emergency warning protocols, processes and procedures have been developed and are regularly tested to alert residents, employees, shoppers, and visitors in Sand City who may be potentially impacted by an actual or impending disaster, such as a tsunami. Communication needs and capabilities to execute all required activities in response and recovery have been addressed as well as the inter-operability aspects of multiple responding organizations and personnel.

The Incident Commander in the field manages communications at an incident using a common communications plan and incident-based communications established solely for use by the command, tactical, and support resources assigned to the incident. All entities involved in managing the incident will use common terminology for communications as prescribed by the National Incident Management System.

The Sand City emergency operations center has special EOC-to-EOC communication equipment installed by Monterey County which facilitates Sand City's EOC communicating with the Monterey County Operational Area EOC as well as the EOCs in neighboring cities such as Monterey, Sand City, Marina, Del Rey Oaks, etc.

10. Operations And Procedures

The City of Sand City has developed and implemented operational procedures to support Sand City's emergency program. These procedures address the issues of the health, safety, and welfare of residents, employees, shoppers, and visitors, and protection of property in Sand City for response to and recovery from the consequences of hazards to be expected in Sand City. Also a situation analysis has been conducted which includes damage assessment and identification of resources to support response, recovery and initiation of mitigation.

11. Logistics And Facilities

The City of Sand City has established logistical capability and procedures to locate, acquire, store distribute, maintain, test, and account for services, personnel, resources, materials, and facilities procured or donated to support the City's emergency management program. E-Team Response Information Management System soft ware will be used by Emergency Operations Center personnel as appropriate to carry out these procedures and provide the desired information to account for all actions.

The City of Sand City will have its primary Emergency Operations Center located in the Council Chambers of the Sand City City Hall to support response and recovery activities. The special EOC-to-EOC radio for the Sand City EOC to communicate with the Monterey County Operational Area EOC and EOCs in Monterey, Seaside, Marina, etc is located there. The E-Team Response Information Management System software will enable virtual EOC operation where most people can use their own workplace computers to conduct activities from their office location. The Council Chamber is

so close that briefings and decision-making conferences can be easily arranged. The Sand City City Hall has facilities to meet basic human needs including a shower, refrigerators, radar range, cooking utensils, sleeping bags and other assets to support 24 hour per day operations in the EOC.

In the event that the Sand City City Hall were to be damaged as might be possible in an earthquake, the first alternate EOC location will be across the street in the Sand City Public Works office trailer which is capable of supporting continuity, response, and recovery operations. Portable computers, cell phones, and other temporary equipment will allow essential operations to continue. If the trailer has been damaged, a second alternate location for the EOC might be in an undamaged location such as the Salvation Army facility in Sand City.

12. Training

The City of Sand City has assessed training needs for the City's emergency program and has developed and implemented a training/ educational curriculum to support the City's program. This training will comply with all applicable regulatory requirements. The Sand City Office of Emergency Services (OES) is responsible for arranging for all training required under the National Incident Management System (NIMS) and California's Standardized Emergency Management System (SEMS) regulations

The State is in the process of modernization of California's Response Information Management System (RIMS) by E-Team. Appropriate city employees will attend E-Team RIMS training to be provided by the Monterey County Operational Area in Salinas.

The City's OES is responsible for arranging for appropriate training for all emergency responders, ensuring that all applicable laws are met, and employees are familiar with and knowledgeable of NIMS and the Sand City's emergency operations plan.

The objective of the training will be to create awareness and enhance the required skills to execute the City's emergency system. The frequency and scope of the training shall be identified. For example, a tabletop exercise will be scheduled at least annually. Training records will be maintained.

13. Exercises, Evaluations, And Corrective Action

Sand City Office of Emergency Services is responsible for developing and distributing an exercise schedule which covers the exercises to be

conducted throughout a given calendar year. Each department is responsible for sending emergency responders to these scheduled events pursuant to the exercise schedule published by the Office of Emergency Services.

An evaluation of the exercise will be conducted after the conclusion of each exercise. The lessons learned will be addressed to determine what appropriate corrective action should be taken.

With regard to actual disasters, the National Incident Management System (NIMS) regulations require any city or county declaring a local emergency for which the governor proclaims a state of emergency to complete and transmit an after-action report to California Office of Emergency Services within (90) days after the close of the incident period. E-Team Response Information Management System software will be used to prepare and submit the after-action report containing the corrective actions to be taken and the scheduling of these actions.

The after-action report will provide, at a minimum, response actions taken, application of NIMS, suggested modifications to NIMS, necessary modifications to plans and procedures, identified training needs, and recovery activities to date.

The after-action report will serve as a source for documenting Sand City's emergency response activities, identifying areas of concern and successes. It will also be utilized to develop and describe a work plan for implementing improvements.

An after-action report will be a composite document for all NIMS levels, providing a broad perspective of the incident, referencing more detailed documents, and addressing all areas specified in regulations. It will include an overview of the incident, including enclosures, and addressing specific areas if necessary.

It will be coordinated with, but not encompass, hazard mitigation. Hazard mitigation efforts may be included in the 'recovery actions to date' portion of the after-action report.

The Sand City Office of Emergency Services will be responsible for the completion and distribution of the Sand City after-action report, including sending it by E-Team RIMS software to the Governor's Office of Emergency Services Coastal Region within the required 90-day period. They may coordinate with the Monterey Operational Area in the completion of the after-action report, incorporating appropriate information from them for the report.

For Sand City, the after-action report's primary local audience will be City management and employees. As public documents, they are accessible to anyone who requests a copy.

Data for the after-action report will be collected from a questionnaire, E-Team RIMS documents, other documents developed during the disaster response, and interviews of emergency responders. The most recent After-Action Report Instructions and Report Form are available on E-Team Response Information Management System software.

14. Crisis communication and Public Information

The Sand City Office of Emergency Services has developed procedures to disseminate and respond to requests for pre-disaster, disaster, and post disaster information, including procedures to provide information to internal and external audiences, including the media, and deal with their inquires.

The Mayor and city council members under the direction of the Director of Emergency Services (City Administrator) will be responsible for disseminating accurate and timely information to city employees, residents, businesses, industries, shoppers, and visitors in Sand City. The Mayor may ask various residents and personnel from Sand City businesses and industries to assist in these public information outreach efforts. The Mayor will also brief the media before disasters when advance information and warning about possible forthcoming events such as tsunamis has been received from the National Weather Service. The Mayor and council members should talk to and listen to these employees, residents, visitors, the various media representatives and others to monitor their concerns and provide appropriate answers to address these concerns.

The Director of Emergency Services will designate a Public Information Officer to coordinate all crisis communication and public information activities with the Mayor and council members. The PIO will clear such activities with the Director so that there will one official source of information about disasters in Sand City. The public information officer's responsibilities include: providing a contact facility for the media; developing a system for collecting accurate and timely information about the disaster and the city's response efforts; preparation of regular information bulletins; procedures for obtaining clearance and release of official information; procedures for dissemination of information to disabled populations; procedures

for dissemination of guidelines for evacuation, sheltering, and shelter-in-place

Public education and awareness programs shall be developed for hazards such as earthquakes and tsunamis which may pose problems for residents, businesses, and others in Sand City. City employees including Police and Public Works personnel need to know how to respond, where to respond, and how to minimize the impact of the disaster. The residents, businesses, industries, shoppers and visitors need to know how they will be notified of impending disasters, the potential effects of the disasters, and how to protect themselves from the impact of the disasters.

15. Finance and Administration

The City of Sand City has developed effective financial management and administrative procedures to provide accurate financial records before, during, and after disasters. This system should provide for flexible and responsive action to provide timely assistance for disaster activities and procurements requested by the Incident Commander. The accounting procedures should provide documentation for recording financial data for future cost recovery.

The financial procedures include: definition of responsibilities for financial authority, including reporting relationship to Director of Emergency Services; procurement procedures; payroll; and accounting system to track and document costs.

Appendix A – City of Sand City Resolution

Resolution Of The Sand City Council To Approve The Emergency Operations Plan And To Adopt The National Incident Management System

WHEREAS, the preservation of life, property, and the environment is an inherent responsibility of local government. The City of Sand City has prepared this emergency operations plan to ensure the most effective and economical employment of resources for the maximum benefit and protection of the community in time of emergency; and

WHEREAS, the objective of this plan is to incorporate and coordinate all the facilities and personnel of the city into an efficient organization capable of responding to any emergency. This plan establishes the emergency organization, assigns tasks, specifies policies, and general procedures, and provides for coordination utilizing the National Incident Management

System (NIMS) and California's Standardized Emergency Management System (SEMS).

WHEREAS, the Department of Homeland Security has established the National Incident Management Plan to standardize emergency management in all states;

NOW, THEREFORE BE IT RESOLVED that sand City Council hereby approves this emergency operations plan and adopts the National Incident Management System (NIMS).

PASSED AND ADOPTED by the Sand City Council on this 4th day of October, 2005, by the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:
ATTEST: Linda Scholink, City Clerk
APPROVED: David K. Pendergrass, Mayor

Appendix B - Recovery Plan

Concept of Operations

The City of Sand City will be involved in recovery operations. In the aftermath of a disaster, many citizens will have specific needs that must be met before they can pick up the thread oftheir pre-disaster lives. Typically, there will be a need for such services as these: assessment of the extent and severity of damages to homes and other property; restoration of services generally available in communities - water, food, and medical assistance; repair of damaged homes and property; recovery of records professional counseling when the sudden changes resulting from the emergency have resulted in mental anguish and inability to cope. The City of Sand City will help individuals and families recover by ensuring that these services are available and by seeking additional resources if the community needs them.

Recovery occurs in two phases: short-term and long-term. Short-term recovery operations will begin during the response phase of the emergency. The major objectives of short-term recovery operations include rapid debris removal and clean-up, and orderly and coordinated restoration of essential services (electricity, water, and sanitary systems). Short-term recovery operations will include all the agencies participating in the City of Sand City's disaster response.

Techniques for recovery of valuable records: Today, so much is restorable that the question is no longer what can we save but what is worthwhile to save. It is only cost-effective to restore items that can't be replaced or reproduced, or where originals are required by law. A recovery expert can confirm restorability and help set priorities.

Order of recovery: Prior to a disaster, there should be at least a rudimentary plan for the order of recovery. When multiple department records are damaged, conflicts may arise at the disaster scene over whose records are most time-critical. With the mitigation clock ticking, the time of impact is not the time to determine recovery priorities.

Timely Emergency Response: Technologies now exist to restore most forms of vital records. A crucial factor determining restorability is an effective emergency response that stabilizes the items and keeps restoration options open. Paper and other forms of vital records deteriorate rapidly when wet or contaminated, and mitigation steps must be implemented immediately. Especially in cases where the quantity of records is so great that pack-out may take days, the ambient conditions of the environment in which they're housed need to be brought under control quickly. When humidity and temperature levels are elevated, degradation of paper is rapidly accelerated. To stabilize the environment, humidity levels must be brought to 40 percent or less and temperatures to 70° F or less. If a significant portion of the building is wet and it's 90° F outside, this is no small feat. The restoration contractor will have temporary temperature and humidity control equipment available to achieve these conditions. If operational, the mechanical systems in the building may also be used.

Vendor Pre-Appointment: It is especially prudent to have a pre-appointed restoration contractor who has experience restoring vital records. In the heat of the battle, the decisions which need to be made regarding disposition and restoration of records will come fast and furious. During the crucial hours immediately following a crisis, having a pre-loss vendor relationship and recovery strategy goes a long way. The following mitigation suggestions are offered to help recovery personnel through the immediate moments following an event.

Water-Damaged Media: Since 90 percent of all disasters involve moisture from floods or fire suppression, water damage mitigation steps for various media are as follows:

Paper Documents and Books: Despite an our technological advances, paper is still predominant in government and business. Wet books and documents should be frozen as soon as possible to forestall degradation. It is recommended that a freezer trailer and a frozen storage vendor be pre-approved in the recovery plan, although the restoration contractor should have those resources available.

Since water-damaged materials can be frozen safely for an indefinite period of time, planners can freeze all materials immediately and later consider what to restore versus discard, as well as the best restoration options for the situation. There are various methods of restoring paper documents.

Books are more of a challenge than paper documents because of the binding and the potential for warping. Books must be handled and packed very carefully; they should not be opened or closed; their covers should not be removed; and they should be packed loosely, spine side down, in plastic milk crates or plastic bags placed in boxes. Freeze-drying is the preferred method for restoring books.

CDs and Optical Media: Scratches on optical media can cause data loss, so gloves should be worn and the media handled with care when recovering. As long as no physical damage has occurred, cleaning and data recovery can be relatively easy.

Magnetic Tapes, Microfilm, X-Rays, and Photographs: If wet, these media types should be placed in plastic bags and put in cold storage to keep from drying out. (A refrigerator will suffice for small quantities.) If allowed to dry, the coatings present on many types of film may cause layers to stick together and important information to be tom off.

If they cannot be dealt with in less than five days, tapes, microfilm, X-rays, and photographs should be frozen. Long-term wet storage will cause additional damage. Tapes can be cleaned on special equipment that removes contaminants and re-tensions the tape.

Fire- and Mold-Damaged Media: Other types of damage to vital records such as fire damage, toxic chemicals, biological contaminants, and mold can be restored. For fire damage, processes such as ionized air-washing and deodorization can be employed. Soot particulate must be removed, and trimming or re- processing may be required if permanent damage has occurred. For bacteria and mold, Gamma and Electron Beam Radiation may be used to sterilize the documents if they can be transported to a

laboratory. Other treatments may include manual cleaning in containment areas using down-draft tables to capture mold spores.

Inventory Control Restoration contractors should have inventory control systems that prevent document loss and enable any document to be located and retrieved in a timely manner. This is especially important for working documents such as court records.

Short Term Recovery

The goal of short-term recovery is to restore local government services to at least minimal capacity. Short-term recovery includes: utility restoration; expanded social; medical and mental health services; reestablishment of City of Sand City government operations; transportation route restoration; debris removal and clean-up operations; and demolition of hazardous structures.

The City of Sand City will coordinate with private utility companies on all efforts to restore utility systems and services during recovery operations.

For federally-declared disasters, tele-registration centers may be established by the Federal Emergency Management Agency (FEMA) to assist disaster victims and businesses in applying for individual assistance grants and Small Business Administration loans.

The American Red Cross will provide sheltering for disaster victims until housing can be arranged.

The City of Sand City will ensure that debris removal and clean-up operations are expedited during short-term recovery operations.

Long Term Recovery

The goal of long-term recovery is to restore facilities to pre-disaster condition. Long-term recovery includes hazard mitigation activities, restoration and reconstruction of public facilities, and disaster response cost recovery.

The major objectives of long-term recovery operations include: coordinated delivery of long-term social and health services; improved land use planning; re-establishing the local economy to pre-disaster levels; recovery of disaster response costs; and the effective integration of mitigation strategies into recovery planning and operations.

The City of Sand City will handle long-term recovery activities in coordination with the Monterey County Operational Area.

The City of Sand City will be responsible for its own approaches to mitigation which could include zoning variances, building code changes,

plan reviews, seismic safety elements, and other land use planning techniques. With public safety a primary concern, rapid recovery may require adjustments to policies and procedures to streamline the recovery process.

Hazard mitigation actions will need to be coordinated and employed in all activities by the City of Sand City in order to ensure a maximum reduction of vulnerability to future disasters. The City will strive to restore essential facilities to their pre-disaster condition by retrofitting, repairing or reconstructing them during long-term recovery operations.

Recovery programs will also be sought for individual citizens and private businesses. The City of Sand City's redevelopment agency will play a vital role in rebuilding commercial areas of Seaside.

Recovery Operations Organization

For the City of Sand City, recovery operations will be managed and directed by the City Administrator. Recovery issues involving other jurisdictions will be coordinated and managed between the City Administrator and their designated representatives. On a regularly scheduled basis, the City Administrator will convene meetings with department managers, key individuals, and representatives from affected jurisdictions. These meetings will be held to collectively make policy decisions and to gather and disseminate information regarding completed and ongoing recovery operations. Sand City departments will also be represented and responsible for certain functions throughout the recovery process.

Recovery Operations Responsibilities

The City of Sand City has specific responsibilities in recovering from a disaster. The functional responsibility chart, listed below, depicts the functional responsibilities assigned to each of the departments.

Function: Political process management; interdepartmental coordination; policy development; decision making; and public information. *Departments/Agencies:* City Administrator

Function: Land use and zoning variance; pennits and controls for new development; revision of building regulations and codes; code enforcement; plan review; and building and safety inspections. *Departments/Agencies:* City Planning Dept

Function: Debris removal; demolition; construction; management of and liaison with construction contractors; restoration of utility services. *Departments/Agencies:* Public Works Dept.

Function: Public finance; budgeting; contracting; accounting and claims processing; taxation; insurance settlements. *Departments/Agencies:* City Finance Dept.

Function: Redevelopment of existing areas; planning of new redevelopment projects; and financing new projects. *Departments/Agencies:* City Redevelopment Agency

Function: Applications for disaster financial assistance; liaison with assistance providers; onsite recovery support; disaster financial assistance. *Departments/Agencies:* FEMA

Function: Advise on emergency authorities, actions, and associated liabilities; preparation oflegal opinions; preparation of new ordinances and resolutions. *Departments/Agencies:* City Attorney

Function: Government operations and communications; space acquisition; supplies and equipment; vehic!es; personnel; and related support. *Departments/Agencies:* Administrative Services

Damage Assessment

Under the Sand City Emergency Operations Plan, an Initial Damage Estimate is developed during the emergency response phase to support a request for gubernatorial proclamation and for the State to request a presidential declara.tion. This is followed by a detailed assessment of damage during the recovery phase by the City of Sand City. This detailed assessment provides the basis for determining the type and amount of state and/or federal financial assistance available for recovery.

In coordination with Monterey County Operational Area, the Sand City Public Works Department will complete the detailed damage/safety assessment.

Documentation

Documentation is the key to recovering emergency response and recovery costs. Damage assessment documentation will be critical in establishing the basis for eligibility of disaster assistance programs.

Under the State Natural Disaster Assistance Act (NDAA), documentation is required for damage sustained to public buildings, levees, flood control works, irrigation works, county Toads, city streets, bridges, and other public works.

Under federal disaster assistance programs, documentation must be obtained regarding damage sustained to: roads; water control facilities; public buildings and related equipment; public utilities; facilities under

construction; recreational and park facilities; educational institutions; and certain private non-profit facilities.

Debris removal and emergency response costs incurred by the affected entities should also be documented for assistance purposes under the federal programs. It will be the responsibility of the City of Sand City to collect documentation of these damages.

The documented information should include the location and extent of damage, and estimates of costs for debris removal, emergency work, and repairing or replacing damaged facilities to pre-disaster condition.

The cost of compliance with building codes for new construction, repair, and restoration will also be documented. The cost of improving facilities may be included under federal mitigation programs.

Documentation is key to recovering expenditures related to emergency response and recovery operations. For the City of Sand City, documentation must begin at the field response level and continue throughout the operation of the Sand City Emergency Operations Center.

After-Action Reporting

The National Incident Management System (NIMS) regulations require any city and county declaring a local emergency for which the governor proclaims a state of emergency to complete and transmit an after-action report to California Office of Emergency Services within (90) days of the close of the incident period. E-Team Response Information Management System software will be used to prepare and submit the after-action report.

The after-action report will provide, at a minimum, response actions taken, application of NIMS, suggested modifications to NIMS, necessary modifications to plans and procedures, identified training needs, and recovery activities to date. The after-action report will serve as a source for documenting the City of Sand City's emergency response activities, identifying areas of concern and successes. It will also be utilized to develop and describe a work plan for implementing improvements. The after-action report will be a composite document for all NIMS levels, providing a broad perspective of the incident, referencing more detailed documents, and addressing all areas specified in regulations. It will include an overview of the incident, including enclosures, and addressing specific areas if necessary.

It will be coordinated with, but not encompass, hazard mitigation. Hazard mitigation efforts may be included in the 'recovery actions to date' portion of the after-action report.

The Sand City Office of Emergency Services will be responsible for the completion and distribution of the Seaside after-action report, including sending it by E-Team RIMS software to the Governor's Office of Emergency Services, Coastal Region within the required 90-day period. They may coordinate with the Monterey Operational Area in the completion of the after-action report, incorporating information from them for the report, as appropriate.

For the City of Sand City, the after-action report's primary local audience will be Sand City management and employees. As public documents, they are accessible to anyone who requests a copy.

Data for the after-action report will be collected from a questionnaire, E-Team RIMS documents, other documents developed during the disaster response, and interviews of emergency responders. The most recent After-Action Report Instructions and Report Form are available on E-Team RIMS software.

Disaster Assistance Programs

When requesting disaster assistance, some key areas of concern must be addressed. These areas include the needs of distinct groups, disaster assistance available at each level of declaration, and the level of detail required on each request for disaster assistance.

The disaster assistance programs have been developed for the needs of four distinct groups: individuals; businesses; governments; and non-profit organizations.

Individuals may receive loans or grants for such things as real and personal property, dental, funeral, medical, transportation, unemployment, sheltering, and rental assistance, depending on the extent of damage.

Loans for many types of businesses are often made available through the United States Small Business Administration, assisting with physical and economic losses as a result of a disaster or an emergency.

Funds and grants are available to government and non-profit organizations to mitigate the risk of future damage.

Type of Emergency Declaration

A state grant program is available to local governments to respond and recover from disasters. Federal grant programs are available to assist

governments and certain non-profit organizations in responding to and recovering from disasters. At each level of emergency declaration, various disaster assistance programs become available to individuals, businesses, governments, and non- profit organizations. Under local emergency declarations, the City of Sand City may be eligible for assistance under the Natural Disaster Assistance Act (with concurrence of the Director of the Governor's Office of Emergency Services).

Businesses and individuals may be eligible for local government tax relief, low-interest loans from the United States Small Business Administration, and relief programs under the United States Department of Agriculture. For example, individuals should read Internal Revenue Service Publication 2194 (Rev 2004) '2004 Disaster Losses Kit: Help from the IRS.' Similarly, businesses should read IRS Publication 2194B (Rev.2004) '2004 Disaster Losses Kit: Help from the IRS.'

Under a State of Emergency Proclamation by the Governor, the City of Sand City, special districts, individuals, and businesses may be eligible, in addition to the assistance available under a local emergency declaration, for services from the following agencies: Contractor's License Board; Department of Insurance; Department of Social Services; Franchise Tax Board Tax Relief; Department of Motor Vehicles; Department of Aging State Board of Equalization; and Department of Veteran's Affairs (CALVET).

Under a Presidential Declaration, City of Sand City, individuals, and businesses may be eligible for the following disaster assistance programs and services: Cora Brown Fund; Crisis Counseling Program; Disaster Unemployment; Temporary Housing Program; Individual and Family Grant Program; Internal Revenue Service Tax Relief; Public Assistance; Hazard Mitigation; Veteran's Affairs Assistance; and Federal Financial Institutions.

Public Assistance Program Responsibilities

City of Sand City and private agencies have the responsibility for the completion and submission of the required documents for both state and federal public assistance programs for their jurisdiction, agency, or company.

Specifically, the Sand City Office of Emergency Services (OES) will complete the necessary public assistance program application and supporting materials. Additionally, Sand City OES will be the primary contact for state and federal field representatives.

Individual Assistance Program Responsibilities

Individuals are expected, whenever possible, to provide for themselves and direct their own personal recovery. However, many individuals will expect the City of Sand City to deliver assistance to them well after the disaster.

The City of Sand City will assist the individuals in any way possible, including providing them with the Federal Emergency Management Agency's (FEMA) hotline number for individual assistance.

A sequence of delivery guide has been developed by FEMA to assist individuals and local governments in determining the flow of individual assistance. City of Sand City's objective is to provide the citizens of their community with all the necessary information to help themselves recover from the disaster. The sequence of delivery appears as follows: individual actions for assistance (family, friends, volunteer organizations, churches, etc.); recovery/assistance from private insurance carrier; FEMA disaster housing assistance; United States Small Business Administration assistance; individual and Family Grant Program assistance; and Cora Brown Fund Assistance.

Hazard Mitigation Grant Program Responsibilities

Within declared jurisdictional areas, the Sand City Office of Emergency Services is responsible for identifying projects that will substantially reduce the risk of future damage, hardship, loss, or suffering from a disaster. Each identified mitigation project must be cost effective and meet basic project eligibility.

Appendix C - Sand City Emergency Response Checklists

Virtual Emergency Operations Center

It is assumed that the California Office of Emergency Services has modernized the State's Response Information System (RIMS) with the E-Team crisis management software system which will allow activation of a virtual emergency operations center in a disaster. The City Administrator, Planning Director, Finance Director and other City Hall employees will report to their usual offices in order to use their computers. The mission of the virtual EOC is coordination of information and resources to support the on-scene Incident Commander in the field. The virtual EOC submits reports to and receives information from the Monterey Operational Area and requests mutual aid resources using E-Team RIMS software.

The City Administrator will be the Director of Emergency Services and acting Operations Section Chief. The Operations Section will communicate with the Incident Commander and his staff in the field.

The Planning Director will be the Planning Section Chief responsible for situation status, resource status, and documentation. He will also be the acting Logistics Section Chief communicating with the Incident commander and his staff in the field to prepare requests for mutual aid resources.

The Finance Director will be the Finance Section Chief.

Elected Officials

Responsible for: protection of the residents and their property and the businesses of the City of Sand City

Date of Activation _____

Reason for Activation _____

Report to Emergency Operations Center

Report to Sand City Emergency Operations Center

Mayor _____

Vice-Mayor _____

Council Member _____

Council Member _____

Council Member _____

Attend regular scheduled briefings for council members as arranged by the Director of Emergency Services

Public Outreach

Mayor & council members act as Public Information Officers under direction of Director of Emergency Services to keep the media, residents, and businesses aware of the extent of the disaster and the City's response actions. Mayor may invite some residents and leaders in Sand City businesses and industries to assist in these public outreach efforts. Talk to residents, workers, shoppers and visitors to Sand City to monitor community's response to the disaster

Disaster Proclamation

Meet as the City Council to endorse and sign the 'declaration of a local emergency' which had been prepared and sent to the Monterey County Operational Area by the Director of Emergency Services or to make determination as to whether or not to declare a local disaster

Director Of Emergency Services (City Administrator)

Responsible for: Sand City's emergency management program

Date of Activation: _____

Reason for Activation: _____

Notification

Notify Sand City elected officials about disaster

Notify elected officials that Emergency Operations Center is activated

EOC Activation

Initiate Sign-in/Sign-out log

Initiate EOC Action log

Initiate Incident Situation log

Initiate Resource Status log

Public Information Officer _____

City Attorney _____

Operations Section _____

Planning Section _____

Logistics Section _____

Finance Section _____

Communications

Initiate EOC Message log

Test telephone lines

Test EOC radio to contact Monterey Operational Area EOC

Notify Monterey County Operational Area that Sand City EOC is operational

Notify Monterey, Seaside, and Marina EOCs that Sand City EOC is operational

Submit initial E-Team Response Information Management System User Profile

Report to Monterey Operational Area

Monitor Emergency Digital Information System messages on computer

Monitor TV for news and Emergency Alert System messages

Check for Amateur Radio operator on site in EOC (If not, request a ham from Monterey Operational Area Auxiliary Communications Officer)

Possible EOC Relocation to Alternate Site

Alternate site at _____

Notify Monterey Operational Area EOC if alternate site activated

Notify Monterey, Sand City, Marina EOCs if alternate site activated

EOC Operations

Receive hourly briefing from EOC staff

Brief Mayor and Council members regularly

Assign role of Public Information to: _____

Check that maps, situation, and resource status boards are being updated to provide information for E-Team Response Information Management System

Virtual EOC Operations

Submit E-Team RIMS reports as appropriate: Quick Incident report; Jurisdiction Situation report Resource Requests; Critical Assets; . Road Closure report; Shelter report; Press Releases; Etc

EOC Decisions

Mass Care Shelters (if appropriate)

Contact Monterey Operational Area EOC to request Red Cross to establish a mass care shelter in Sand City

If Red Cross is unable to help immediately, Sand City will establish a temporary mass care shelter at _____ with a City shelter manager

Mayor and Public Information Officer will make public announcements about location and activation of mass care shelters

Shelter in Place (if appropriate)

Mayor and Public Information Officer will make public announcements if shelter-in-place is the appropriate action.

Evacuation (if necessary)

Mayor and Public Information Officer will make public announcements if evacuation is necessary.

Police assisted by Public Works will plan routes and other aspects (who, how many, when, to where, etc)

Police Car loudspeakers and Emergency Alert System will be used

Notify residents, industries, businesses, shopping centers, and visitors

Arrange for emergency towing and fuel supplies to be available

Arrange for busses to pick up persons who do not have transportation

Notify Monterey Operational Area EOC of beginning and completion of evacuation operations

Damage Reporting and Assessment

Assign Damage Reporting and Assessment Teams to conduct an initial windshield survey of certain locations

Each team should consist of a minimum of two individuals, one of whom is Red Cross

Compile initial Damage Assessment reports and submit to Monterey Operational Area EOC using E-Team RIMS reports

Assign one member of the Damage Assessment team to accompany each Federal/State Damage Assessment Team (as necessary) for detailed damage assessment.

Maintain records of all expenditures related to damage assessment activities and submit to appropriate authorities.

Disaster Recovery Operations

Maintain records to document expenditures by Sand City during the incident.

Assist State and Federal agencies in establishing disaster assistance centers where residents and businesses can apply for loans and grants, as appropriate

Prepare Sand City's After Action Report and submit it to the Monterey Operational Area EOC using E-Team RIMS reporting software

Incorporate lessons learned during the disaster into Sand City's emergency operations plan

Notify the Monterey Operational Area EOC that Sand City is closing down its EOC.

Public Information Officer

Responsible for: coordination with news media and preparation of press releases Reports to: Director of Emergency Services and coordinates with Mayor

Date of Activation: _____

Reason for Activation: _____

Notification

Report to Sand City emergency operations center

Contact Monterey Operational Area EOC's Public Information Officer

Make initial contact with various TV, radio, and news media

Operations

Initiate PIO Action log

Receive briefing from Director of Sand City EOC and staff on the latest information on status of incident

Prepare press releases for approval of Director before release

Coordinate press releases with Monterey Operational Area EOC.

Monitor media coverage of the emergency.

Establish a media briefing room for the Mayor, City Council members and PIO to meet with the media

Police Branch

Responsible for: on-scene Incident Command, law enforcement, security of residents and businesses

Reports to: Director of Emergency Services

Date of Activation: _____

Reason for Activation: _____

Response to incidents

Respond to incidents and become the on-scene Incident Commander

Contact Sand City EOC and keep them informed as to response activities

Operations

Conduct initial windshield damage assessment and report to Sand City EOC, if requested

Provide police security at critical location, if necessary

Restrict access to areas with assistance of Public Works, if necessary

Direct emergency debris removal by Public Works, if necessary

Request EOC to obtain mutual aid resources, if necessary

Notify residents, businesses, shoppers, and visitors about Sand City EOC decisions on mass-care shelters and their location, or shelter-in-place policy, or evacuations, as directed by EOC

Supervise evacuation with special consideration for the disabled and anyone needing transportation

Establish police car patrols throughout Sand City to reassure the public that police protection and assistance are continuously available

Fire Branch (Representatives from Monterey Fire Department)

Responsible for: firefighting and rescue (under contract with Sand City)

Reports to: on-scene Incident Commander

Date of Activation: _____

Reason for Activation: _____

Response to incidents

Monterey Fire detachment responds to incident and reports to Incident Commander

Detachment keeps Monterey Fire Department informed of firefighting/rescue activities

Operations

Identify need for Hazmat operations

Request Sand City EOC to send request to Monterey Operational Area to provide specialized Hazmat support from Seaside Fire Department, if necessary

Assist Seaside Hazmat team with rescue, as feasible

Assist Seaside Hazmat team with decontamination of victims, fire and rescue personnel, when necessary

Provide emergency lighting for rescue operations, if necessary

Assist with emergency shutoff of electricity, gas, and water utilities, if necessary

Assist with alerting and evacuation of residents and the disabled, if requested

Assist with collection of damage assessment data, if requested

Appendix D - Continuity of Government Plan

Succession

There must be continuity of leadership in any disaster. If personnel have been injured or unable to report to the emergency operations center, or if the transportation system has been disrupted because of damage to roads, bridges, or overpasses, there must be designated successors for each official position. Sand City Municipal Code Chapter 2.12 discusses succession in section 2.12.080 (b). The City Administrator will designate successors for his position as Director of the Emergency Operations Center. The City Council must approve these nominations. The City Administrator will also designate successors for each of the department heads.

Pre-delegation of emergency authority

Chapter 2.12.080 specifies the actions which are authorized after the City issues a declaration of an emergency. The director is empowered to:

(1) Request the City Council of Sand City to proclaim the existence or threatened existence of a 'local emergency' if the city council is in session, or to issue such proclamation if the city council is not in session. Whenever a local emergency is proclaimed by the director, the city council shall take action to ratify the proclamation within seven days thereafter or the proclamation shall have no further force or effect;

(2) Request the Monterey County Operational Area to request the Governor to proclaim a 'state of emergency' when, in the opinion of the

director, the locally available resources are inadequate to cope with the emergency;

(3) Control and direct the effort of the emergency organization of this city for the accomplishment of the purposes of this chapter;

(4) Direct cooperation between and coordination of services and staff of the emergency organization of this city, and resolve questions of authority and responsibility that may arise between them;

(5) Represent this city in all dealings with public or private agencies on matters pertaining to emergencies as defined herein;

(6) In the event of the proclamation of a 'local emergency' as herein provided, the proclamation of a 'state of emergency' by the Governor or Director of the State Office of Emergency Services, or the existence of a 'state of war emergency,' the director is empowered: (A) To make and issue rules and regulations on matters reasonably related to the protection of life and property as affected by such emergency; provided, however, such rules and regulations must be confirmed at the earliest practicable time by the city council; (B) To obtain vital supplies, equipment, and such other properties found lacking and needed for the protection of life and property and to bind the city for the fair value thereof and, if required immediately, to commandeer the same for public use; (C) To require emergency services of any city officer or employee and, in the event of the proclamation of a 'state of emergency' in the county in which this city is located or the existence of a 'state of war emergency,' to command the aid of as many citizens of this community as he or she deems necessary in the execution of his or her duties; such persons shall be entitled to all privileges, benefits, and immunities as are provided by state law for registered disaster services workers; (D) To requisition necessary personnel or material of any city department or agency; (E) To execute all of the ordinary power of the city administrator, all of the special powers conferred upon him or her by this chapter or by resolution or emergency plan pursuant hereto adopted by the city council, all powers conferred upon him or her by any statute, by any agreement approved by the city council, and by any other lawful author.

Emergency action steps

Procedures have been developed to facilitate the ability of Sand City personnel to respond quickly to any disaster. Checklists and standard operating procedures have been prepared which identify disaster assignments, responsibilities, and disaster duty locations. Procedures have

been promulgated for alerting, notifying and recalling key members of the Sand City emergency organization

Primary emergency operations center

The primary emergency operations center for the City of Sand City is the Sand City Council Chambers in City Hall. Monterey County has installed a special EOC-to- EOC radio in the council chambers to facilitate direct communications between Sand City's EOC and Monterey County Operational Area's EOC in case of earthquake or flood damage to the telephone system. Sand City can also communicate directly with the other cities of the county, such as Monterey, Seaside, Marina, etc. When the E-Team emergency management software replaces California's Response Information Management system (RIMS) computer reporting system, it may be possible to have a virtual EOC operation in Sand City. The City Administrator could use the computer in his office to submit required reports, request resources from the Operational area, prepare after-action reports, etc, and be continually up-to-date on all available information. Similarly, the Community Development director could manage the virtual EOC's planning section from his office and stop using whiteboards for manually posted situation and resource data displays in council chambers The council chambers can be used for briefings of city council members or periodic conferences of the EOC section chiefs with the EOC Director.

Alternate emergency operations center

A catastrophic earthquake might damage City Hall so that the primary EOC could not be in the council chambers. The first alternate site would be the Public Works trailer in the Sand City Corporation Yard. Temporary use of lap-top computers would be possible. If the E-Team software is operational, coordination of information and resources in the alternate EOC could still be carried out.

Alternate back-up facilities

If some offices in City Hall were able to be partially repaired so as to be habitable, perhaps the Community Development Department, the City Administrator, or some of the Police Department offices could continue functioning during emergency conditions. It might even be possible to operate a virtual EOC using the E-Team software system.

Vital records

Special efforts will be necessary to protect vital records such as Police Department records, Community Development and Redevelopment records,

City Council minutes and ordinances, personnel files, etc so that the City of Sand City can continue to function during and after disasters. Procedures should be developed to permit the selection, preservation and availability of records essential for continuing functioning under disaster conditions.

Protection of resources, facilities, and personnel Measures should be taken to disperse resources and personnel to provide redundancy to assist in the City's functioning during disasters. Resources and personnel must be protected and trained in protective measures so that operations can continue during and after a disaster.

Use of the National Incident Management System The National Incident Management System will be used to identify the management functions assigned to various positions. In minor emergencies, many of the management functions might be handled by one or two persons. Procedures should be developed for the following: control of access to the area affected by the disaster; identification of personnel engaged in activities at the incident; accounting for personnel engaged in incident activities; accounting for persons affected, displaced, or injured by the disaster; mobilization and demobilization of resources; provision of temporary, short-term, or long-term housing, feeding, and care of populations displaced by a disaster; recovery, identification, and safeguarding of human remains (the National Foundation for Mortuary Care has recommended practices for mass casualty events); provision for the mental health and physical well-being of individuals affected by the disaster; and provision for managing critical incident stress for responders.

Facilities

The City of Sand City facilities are capable of accommodating the essential workers to continue to provide essential services. There will be adequate temporary workspace, communications, and computers. Basic human needs of eating, sleeping, and showering will facilitate gathering essential information necessary to provide direction, control and warning for response and recovery actions.

Lessons From Disasters: What Policy Leaders Need To Know

Lessons From Disasters, Russell Coile, Ph.D, CEM, Disaster Preparedness Coordinator, Sand City Police Department
Mayors & Council Members Executive Forum, July 29, 2004

Why Are You Here?

To consider what actions should be taken to prepare your city for possible disasters; and to consider your responsibilities for disaster preparedness and disaster response.

Why Am I Here?

Certified Emergency Manager; Registered Professional Engineer; Disaster Program Manager; Director Disaster Services; Disaster Preparedness Coordinator.

Why Are We Here?

California is disaster land! Earthquakes; fires; floods; power outages; civil unrest; and terrorism. Earthquake Damage to buildings, houses, schools, businesses, streets, freeways, overpasses, bridges; no electrical power; no gas; no water; and no sewer.

Loma Prieta Earthquake (Santa Cruz)

Oct 17, 1989; Killed – 63; Injured – 3,757; Homes destroyed – 1,018; Homes damaged – 23,408; Businesses damaged – 3,530; Property damage – $ 5.9 billion.

Northridge Earthquake (Los Angeles)

Jan 17, 1994; Killed – 57; Hospitalized – 1,566; Injured – 9,158; Houses destroyed – 2,000; Apartments damaged– 32,000; Trailers damaged – 6,000; Property damage – $20 billion.

Oakland/Berkeley Hills Fire

Deaths – 25; Injured – 150; Houses destroyed – 3,354; Apartments destroyed – 456; Fire engines – 305.

Responsibilities Of Mayors & Council Members

Protection of lives & property of citizens; continuity of government; disaster proclamation; establish office of emergency services (OES); and supervise & control.

Disaster Mitigation

Preparedness; response; recovery; policy decisions; evacuate or shelter; and inform your citizens.

Support Your Responders

Fire department; police department; emergency medical units; public works department; Citizen Corps; with adequate personnel, training and equipment.

Citizen Corps

Community Emergency Response Teams; Neighborhood Watch; Volunteers in Police Service; medical reserve corps; and citizen councils.

Other Assistance

California's Standardized Emergency Management System (SEMS); Federal Emergency Management Agency (FEMA); Department of Homeland Security; National Incident Management System (NIMS); and National Response Plan.

Emergency Support Functions

Transportation; telecommunications; public works; firefighting; emergency management; mass care & housing; logistics management; public health & medical; search & rescue; hazardous materials; agriculture; energy; public safety & security; recovery & mitigation; and emergency public information.

Terrorist Events

McDonalds in San Ysidro July 1984 – 21 killed; Salmonella contamination by Rajneeshee 1984 – 751 ill; Oklahoma City bombing April 1995 – 168 killed; Columbine High School April 1999 – 13 killed; and World Trade Center September 2001 – 2,750 killed.

Terrorist Groups

White supremacists; anti-abortionists; Middle East terrorists; militia groups; Earth Liberation Front; and animal rights activists.

Preparedness for Terrorism in Schools

Paper presented at the 14th World Conference on Disaster Management Canadian Centre for Emergency Preparedness, Toronto, Canada, June 19-23, 2004

PREPAREDNESS FOR TERRORISM IN SCHOOLS

Russell C. Coile, Ph.D
Certified Emergency Manager
Disaster Preparedness Coordinator, Sand City Police Department

ABSTRACT

How well are schools prepared for acts of terrorism? School administrators are responsible for the safety of their students, teachers, and staff in any disaster, whether it be a fire, an earthquake, a winter storm, a school violence incident or an act of terrorism. Historical information on various types of terrorism involving schools in the past, as well as discussion of possible acts of terrorism in the future will be reviewed. Preparedness measures which should be of value to schools, fire departments, law enforcement personnel, and emergency medical first responders will be examined.

There have been acts of terrorism in schools in a number of different countries. An international conference in 2000 brought together representatives from Turkey, Israel, United Kingdom, France, Japan, Northern Ireland, Mexico, and the United States to exchange information and suggestions for improved preparedness.

Emergency managers should help schools take prudent measures to prepare for all possible disasters including terrorism. Schools should develop emergency plans, train staff and students in emergency response procedures, and conduct exercises to practice using their plan. In any disaster, local fire, police, and emergency medical units rescue the injured, put out fires, and do whatever is necessary to save lives and protect property. Recommendations for improvements in security and response measures to strengthen preparedness for terrorism in schools and to strengthen general preparedness for natural disasters in schools will be reviewed.

Domestic Terrorists in the United States

The bombing of the Alfred P. Murrah Federal Building in Oklahoma City on April 19, 1995 was a shock to most people living in the United States. Earlier in 1993, we read in newspapers and saw on television the bombing of the World Trade Center in New York City on February 26. However, many of us believed that terrorists were always foreigners from somewhere else. We believed that Americans would not do that sort of thing. Oklahoma City changed all that. We began to realize that there were many different types of 'home-grown' domestic terrorists and extremists in the United States. We found that there were anti-abortion groups, animal rights groups, militia groups, earth liberation front cells, white supremacists, neo-nazi groups, tax protesters, arsonists, patriots, Klu Klux Klan groups, environmental groups, anti-World Trade groups, and even high school age junior terrorists with guns and bombs, etc.

Home-grown Student Terrorists

Two 17 and 18 years old high school students conducted a six hour massacre at Columbine High School in Littleton, Colorado on April 20, 1999. One adult teacher was killed, 14 students were killed, and 22 students were injured. The two boys had apparently plotted for a year to kill at least 500 students and blow up their high school.

Exactly one month after the Colorado massacre, a 16 year old high school student in Conyers, Georgia brought two guns to school. He shot and wounded six of his schoolmates.

On March 5, 2001, a 15 year old high school freshman opened fire at his school in Santee, California, a suburb of San Diego. He killed 1 teacher and 1 student and wounded 13 other students in the worst episode of terrorist shootings since the 1999 Columbine High School massacre.

The shocking thing was that these were not isolated incidents. There have been 15 other school shooting incidents which received publicity between 1996 and 2000. Some of these were:

Feb. 2, 1996 Moses Lake, Wash. 2 students and 1 teacher killed, 1 other student wounded when 14-year-old Barry Loukaitis opened fire on his algebra class.

Feb. 19, 1997 Bethel, Alaska. Principal and 1 student killed, 2 other students wounded by Evan Ramsey, 16, at his high school.

Oct. 1, 1997 Pearl, Miss. 2 students killed and 7 wounded by a 16-year-old who was also accused of killing his mother.

Dec. 1, 1997 West Paducah, Ky. 3 students killed, 5 wounded by a 14-year-old boy as they participated in a prayer circle at Heath High School.

March 24, 1998 Jonesboro, Arkansas. 4 students and 1 teacher killed, 10 other students wounded outside as Westside Middle School emptied during a false fire alarm. Mitchell Johnson, 13, and Andrew Golden, 11, shot at their classmates and teachers from the woods.

April 28, 1999 Taber, Alberta, Canada. 1 student was killed and 1 student was wounded at W. R. Myers High School in the first fatal high school shooting in Canada in 20 years.

Dec. 6, 1999 Fort Gibson, Oklahoma. 4 students wounded and 1 severely bruised in the chaos as a 13-year-old boy opened fire with a 9mm semiautomatic handgun at Fort Gibson Middle School.

Feb. 29, 2000 Mount Morris Township, Michigan. 1 six-year-old girl was shot and killed at Buell Elementary School near Flint, Mich. The assailant was identified as a six-year-old boy with a .32-caliber handgun.

Terrorist Attacks at Schools in Other Countries

An international meeting on helping schools prepare and respond to terrorist attacks was held in Washington DC on February 13-14, 2000. The conference was hosted by the U.S. Department of Education, U.S. Department of State, and the Organization for Economic Cooperation and Development. The hopes and expectations of the representatives were that schools in each country should be prepared for the risks of terrorist attacks as well as for natural disasters, such as fires, hurricanes, power outages, and earthquakes. However, it was generally agreed that there must be a balance between security measures and the desired normal routine of the students feeling safe while studying. Schools must not become 'bunkers.'

Representatives reported on terrorist activities involving schools in their respective countries.

In Israel, there was a terrorist attack on a school in 1974 when 22 students were killed and many others were injured. School security since 1995 has been the responsibility of the Israel Police.

In Turkey, 146 teachers were killed, 373 schools were destroyed, and many children were killed by terrorists between 1984 and 1997. Protective walls have now been constructed around schoolyards to control entrances and exits.

Northern Ireland had a terrorist bombing in Omagh on a Saturday in August 1998, two weeks before the start of a new school year. The square was filled with families and children – it was 'market day' A car bomb killed 31 people and injured 400.

Japan used to be considered a safe country. However, there has been an increase in crime. In an unprecedented incident in June of 2001, eight students were stabbed, and thirteen students and two teachers were injured by a terrorist invader at an elementary school.

While France has not experienced terrorist attacks except in a subway in 1986 and an attack in a shopping arcade in 1994, schools have been involved in two environmental disasters. A severe windstorm damaged schools during the Christmas vacation in December 2001. Luckily there were no students in school so that no students were killed or injured. The second disaster was a chemical explosion outside the city of Toulouse. The blast killed 30 people including one student, injured 30,000 people and damaged 2,500 buildings. Approximately 100,000 individuals were declared victims. Public transportation was destroyed. The emergency communication system did not function and information did not get out to identify who needed help. Of 184 schools, 79 schools and two universities were affected, One school with 850 students was destroyed – there were only cement walls remaining. This disaster raised the question, 'What should be done to provide schools with adequate information and communication systems to help in evacuation and to manage panic.

Mexico has 12 million children in elementary schools. The main problems seem to be air contamination (smog and pollution), bomb threats and drug use. Bomb threats and young people carrying weapons are increasing.

In the United Kingdom, the most common problems in schools have been arson, burglary and theft, but violent crime has increased in recent years. In 1995, a head-teacher was fatally stabbed while intervening in a gang-related argument. A few months later several young children were killed in a school shooting. In another incident a terrorist intruder wielding a machete attacked young children at a nursery-school picnic.

The United States has 53 million students, 3 million teachers and 113,000 schools. The most recent annual statistics showed 29 students killed, 2,837 students expelled for bringing weapons to school, 185,500 serious violent crimes and 1,605,500 incidents of theft.

A study of guns used in school shootings showed that 42 students were murdered, 31 teachers killed, and 115 wounded in 31 gun incidents in the school years from 1993 to 2001. (www.ribbonofpromise.org/stats.html)

Violence in Los Angeles Public Schools

	1990-91	91-92	92-93	93-94	94-95
Assault with deadly weapon	458	483	399	308	292
Battery	874	776	741	629	686
Crimes against property	7396	7905	7215	6676	5449
Destructive devices	178	176	108	52	111
Homicide	1	1	2	0	1
Possession of weapons	1305	1403	1325	1032	1018
Robbery	475	433	451	401	461
Drug offenses	248	259	384	665	959
Sex offenses	404	429	409	427	477

School Associated Violent Deaths in the United States

The National School Safety Center has collected newspaper accounts of violent deaths associated with public, private, or parochial elementary or secondary schools, kindergarden through grade 12, 1992-1993 through 2002-2003.

School year	Male	Female
1992-1993	49	7
1993-1994	41	12
1994-1995	18	3
1995-1996	26	10
1996-1997	18	8
1997-1998	27	17
1998-1999	24	7
1999-2000	26	6
2000-2001	18	4

2001-2002	4	0
2002-2003	5	1
Total	258	75

Kidnapping of School Children

Californians will remember the bizarre kidnapping of school children on July 15, 1976, reference. A school bus with 26 children was taking children home from the Dairyland Union School, Chowchilla, California. Three men wearing masks and waving guns made the driver stop the bus. The driver and children were herded into two vans while the gunmen hid the bus in a bamboo thicket in a dry gulch. The gunmen then drove for eleven hours to an abandoned quarry where they forced the children and the bus driver into an old moving van buried six feet underground. The bus driver with help from the seven oldest boys somehow managed to get the children out to safety after sixteen hours of effort. The three young gunmen who lived in Portola Valley had drafted a ransom note demanding $5 million for return of the children.

New York City Schools on September 11, 2001

After the terrorist attacks on the World Trade Center on September 11th, more than 25,000 people evacuated from the vicinity of the attack, including 5,600 students and school staff. There are eight schools in the general vicinity of the World Trade Center, five of which were in immediate danger. September 11th was the third day of the school year. The plane crashes took place at around 8:48 a.m. and 9:06 a.m. Vibrations were felt throughout the area. All of the schools had safety plans, each unique to its school. Following the crashes, many of the students walked 40 minutes north to a neighboring school, while others went west to the Hudson River where they were moved by boat, and some went south to Battery Park. Students were sent in all directions. Some schools had to quickly revise their safety plans, because the school the students were directed to go to was also in the Ground Zero area.

The New York City Board of Education is currently addressing the following questions:

Is each school's safety plan where it needs to be? Each plan must be scrutinized because of the things that didn't work on September 11th. For

example, evacuation routes had to be changed, cell phones didn't work, etc.

Does each school's safety plan include regular drills, as well as alternative options?

Are all public address systems in working order?

Do all schools have access to cell phones, as well as other communications?

Are mental health issues being adequately addressed in schools throughout the district, not just those in proximity to Ground Zero?

Weapons of Mass Destruction and Terrorism

The FBI considers terrorists to be criminals, reference (1). The FBI defines terrorism as, 'the unlawful use of force or violence against persons or property to intimidate or coerce a Government, the civilian population, or any segment thereof, in furtherance of political or social objectives.'

The FBI is the lead Federal Agency in the crisis response involving a Weapon of Mass Destruction. Their definition of Weapon of Mass Destruction is 'Any weapon designed or intended to:

1. Cause death or serious bodily injury through the release, dissemination, or impact of toxic/poisonous chemical or their precursors.
2. Release radiation or radioactivity at a level dangerous to human life.
3. Any weapon involving a disease organism.
4. An explosive (greater than 4 ounces), incendiary, poison gas, bomb, grenade, or rocket.'

Statistics of Bombing in the United States

The Bureau of Alcohol, Tobacco, Firearms and Explosives of the Department of Justice compiles national statistics on criminal use of explosives. In 1996, for example, there were 1,387 bombings, 504 attempted bombings, 428 incendiary bombings, and 186 attempted incendiary bombings for a total of 2,505 bombings, reference (2). Data for the years 1992 through 1996 shows that during this 5-year period, there was a grand total of 14,018 bombings, with 290 people killed and 2,708 injured.

The targets of these bombing attacks are listed in reference (3). About 5 % (661) of the grand total of 14,282 bombings for the 5-year period were targeted against educational facilities.

The motives which were determined for 8,348 bombings of the grand total of 14,282 bombings are given in reference (4). Vandalism is at the

top of the list with 5,461 bombing incidents. Revenge was next with 2,325 bombings. Juvenile bombing incidents comprised 4,631 of the grand total of 14,282 bombing incidents for this 5-year period, 1992-1996 as shown in reference (5). Eighteen people were killed and 446 injured by juvenile bombings of the grand total of 322 killed and 3,060 injured.

Data for 1997 for the various states shows that California had more bombings than any other state. Reference (6), which presents the number of explosive incidents by state, lists California in number 1 rank with a total of 771 explosive incidents in the year 1997. Illinois had 304 and Florida had 301 explosive incidents. This data is derived from current National Repository data provided by the Bureau of Alcohol, Tobacco and Firearms' AEXIS 2000 and the Federal Bureau of Investigation's Bomb Data Center systems.

During the year of 1997, there was a national total of 2,217 bombing incidents. According to reference (7), 'Total number of Bombing Incidents by Target Type,' 5% (107) were against educational facilities, consisting of 12 college/university incidents and 95 school bombings. Reference (8) on fatalities shows zero killed but 1 injury in college bombings and 17 injured in school bombings of the total of 31 killed and 211 injured in 1997. Data on motives in reference (9) indicates that vandalism was the principal motive for 748 incidents using explosives, with revenge next with 137 of the total of 1,685 of explosive incidents.

Penalties for False Bomb Threats ('Bomb Threat Response: An Interactive Planning tool for Schools. Bureau of Alcohol, Tobacco and Firearms, Dept of the Treasury'). Making a false bomb threat is now a federal offense punishable under United States Code 18-844e, with a penalty of up to ten years in prison, $250,000 fine, or both. This penalty also applies to juvenile offenders.

Arson

The Arson Statistics Report published by the Bureau of Fire, Tobacco and Firearms, reference (10) shows that ATF conducted arson investigations for 3,336 fires in the 5-year period from 1993-1997. There were 383 people killed in these fires and 921 injured.

Church and Sunday School Arson

A special report on church and sunday school arson, the third report of the federal government's National Church Arson Task Force, reference (11), stated that there have been 827 investigations of arsons, bombing,

or attempted bombing that have occurred at houses of worship between January 1, 1995 and October 5,1999. The result has been the arrest of 364 suspects in connection with 294 of the investigations - an arrest rate of 35 percent - more than double the arrest rate of 16 percent of arsons in general. The ages of the 364 arsonists arrested were as follows:

6-13 years old	52	14.3%
14-17 years	92	25.3%
18-24 years	117	32.1%
25-34 years	50	13.7%
35-44 years	28	7.7%
45+ years	25	6.9%

There have been 287 arsonists convicted by federal, state, and local prosecutors in the trials of 206 of these 294 church arson or bombing investigations.

Increasing Activity in Biological Terrorism

Some extremists discovered that biological agents were the poor man's weapon of choice. There have been a number of incidents using these agents, reference. Some of these incidents were:

1984 The Rajneesh used salmonella to try to poison people eating in a restaurant in rural Oregon in an effort to make some voters sick so that the Rajneesh could win an election.

1991 The Minnesota Patriots Council were making ricin, a potent toxin, for use against rural law enforcement officers.

1995 An extremist named Thomas Lavy was arrested in rural Arkansas for brewing up a significant amount of ricin.

1996 Thomas Leahy in Janesville, Wisconsin produced ricin and was attempting to produce botulinum.

April, 1997 A petri dish marked 'anthracis' was delivered to the B'nai B'rith (Jewish Service organization) office in Washington, D.C. The dish was actually a harmless bacteria closely related to anthrax. The response involved closing off two blocks of the downtown area and decontamination of dozens of people.

July, 1998 Three men were arrested in rural Texas for conspiring to use several biological agents in a bizarre scheme against IRS and law enforcement personnel.

February, 1998 Larry Wayne Harris, a former member of the Aryan Nation,

a white supremacist organization was arrested in Las Vegas, Nevada with several bags of a substance marked 'anthrax.' He was released when the substance was determined to be a harmless form of anthrax.

June, 1998 Three men were arrested in Olmito, Texas for threatening to kill federal agents and state officials with biological agents. They claimed to represent the Republic of Texas, a militant organization which claims sovereignty over Texas.

August, 1998 A white powder was spread through several floors of the Finney State Office Building in Wichita, Kansas. A letter at the scene falsely claimed the powder was anthrax. A letter sent by a white supremacist 'Christian identity' group calling itself the Brothers of Freedom of Americans to a local television claimed responsibility.

1999 Numerous letters containing a white powder, labeled 'anthrax' were sent to abortion clincs and various other organizations. Initially, the response included securing the building and decontaminating all people who had come in contact with the letter while the powder was sent by air courier to the FBI Terrorism Lab in Quantico, Virginia. After analysis, these were all determined to be hoaxes.

Terrorist Bombing Incidents at Universities

There were 7 terrorist bombing attacks at universities in the United States between 1978 and 1993 included in the 17 year bombing spree of the 'Unabomber', reference (16). He had other targets as well and his explosive devices killed a total of three people and injured 23. The dates of the university attacks were as follows: May 26, 1978 at Northwestern; May 9, 1979 at Northwestern; October 8, 1981 at University of Utah; May 5, 1982 at Vanderbilt; July 2, 1982 at University of California, Berkeley; May 15, 1985 at University of California, Berkeley; and June 24, 1993 at Yale.

Arson Incidents at Universities

There have been many arson incidents at universities. The U.S. Department of Justice's report 'Crime in the United States 1996' had a tabulation of UCR Part 1 Crimes which included arson. The University of Colorado's Police Department examined these statistics and published a comparison with other universities on the Internet, reference (17). The University of Colorado had 8 arson cases in 1996, Colorado State had 13, University of California, Berkeley had 3, Iowa State had 1, University of Missouri, Columbia had 4, University of Nebraska had 0, University of

Okalahoma had 1, Oklahoma State had 1,Baylor had 0, Texas A&M had 2, Texas Tech, Lubbock had 1, and University of Texas, Austin had 0.

Counterterrorism

Since there may be possibilities of acts of terrorism in our schools and universities as these statistics indicate, what should be done to prepare for these incidents? The Federal Government is taking a number of actions in various agencies to prepare these agencies to assist state and local governments. The Attorney General established a National Domestic Preparedness Office in October 1998, which Congress approved in November 1999. There is a helpful Internet site, reference (18). The Defense Department has been conducting training programs in 120 metropolitan areas to prepare the local police, fire, and emergency medical agencies to operate in incidents involving terrorist use of Weapons of Mass Destruction. There are national programs to establish Metropolitan Medical Response Systems which can rush to a scene to help local hospitals and ambulance units cope with decontaminating large numbers of casualties. Some local Police, fire departments, and hazardous materials organizations are obtaining special equipment and training to prepare for Weapons of Mass Destruction.

Schools should decide what prudent and cost-effective actions they might take to prepare for terrorism as well as all other disasters likely to occur in their geographic location, such as hurricanes, floods, tornadoes, earthquakes, ice storms, etc.

Disaster Preparedness

The Katz Act of the California Education Code, reference (19) requires that schools plan for earthquakes and other emergencies. The law requires schools to do the following:

1. Develop a disaster plan which includes emergency roles, responsibilities, and procedures for students and staff (both certificated and classified).
2. Conducted periodic drills, evacuation exercises, and other emergency response activities.
3. Provide appropriate training for staff and students.
4. Be prepared to have school buildings used as Red Cross shelters by the local community after disasters.
5. Take mitigation measures now to ensure the safety of students and staff in future disasters.

California's School Emergency Response: Using SEMS at Districts and Sites, reference, is an excellent guide for schools for disaster preparedness.

Georgia State Legislation

It may be of interest to note that the State of Georgia passed Senate Bill 74 effective July 1999, which required all schools to prepare school safety plans, reference (21). Article 27 of Chapter 2 of Title 20 was amended to insert a new Code Section 20-2-1185 in the Official Code of Georgia. The major features of this bill were:

(a) Every public school shall prepare a school safety plan to help curb the growing incidence of violence in schools, to respond effectively to such incidents, and to provide a safe learning environment for Georgia's children, teachers, and other school personnel. Such plan shall also address preparedness for natural disasters, hazardous materials or radiological accidents, acts of violence, and acts of terrorism. School safety plans of public schools shall be prepared with input from students enrolled in that school, parents or legal guardians of such students, teachers in that school, community leaders, other school employees and school district employees, and local law enforcement, fire service, public safety, and emergency management agencies. Such plans shall be reviewed, and if necessary updated annually. Such plans of public schools shall be submitted to the local emergency management agency.

(b) A public school may request funding assistance from the state for the installation of safety equipment including, but not limited to video surveillance cameras, metal detectors, and other similar security devices. Funding may be provided to a public school in accordance with a school safety plan prepared by the school and approved by the local board of education, the Department of Education, and the Georgia Emergency Management Agency.

(c) School safety plans prepared by public schools shall address security issues in school safety zones as defined in paragraph (1) of subsection (a) of Code Section 16-11-127.1. School safety plans should also address security issues involving the transportation of pupils to and from school and school functions when such transportation is furnished by the school or school system and school functions are held during non-instructional hours.

(d) The Georgia Emergency Management Agency shall provide training and technical assistance to public school system, and may provide this same training and technical assistance to private school systems, and independent private schools throughout this state in the area of emergency management and safe school operations. This training and technical assistance shall include, but not be limited to, crisis response team development, site surveys and safety audits, crisis management planning, exercise design, safe school planning, emergency operations planning, search and seizure, bomb threat management, and model school safety plans.

Emergency Response of Schools in California

The Petris Bill of the California Government Code reference (22) requires that all school districts respond to emergencies use the Standardized Emergency Management System (SEMS). This means that all plans must now incorporate SEMS procedures, all school personnel must be trained in how SEMS works, and exercises must be conducted to ensure that everyone knows how to use SEMS. This standardized emergency management system was developed after a disastrous fire in Oakland and Berkeley in 1991 when more than 3000 homes burned. The new system was introduced in 1996 after all state employees were trained. The standardized training means that all law enforcement personnel, including California Highway Patrol officers, county deputy sheriffs, State fish and game wardens, and city police receive the same training as firefighters and public works personnel. SEMS requires that each organization understands and uses the following:

1. The Incident Command System - a method of organizing emergency response effort into five functions: command; operations; planning/ intelligence; logistics; and finance/administration.
2. An Emergency Operations Center (or Incident Command Post in the field) with staff organized according to the same five Incident Command System functions.
3. Coordination of the school district's Emergency Operations Center with other Emergency Operations Centers of the Operational Area (County), City, and County's Office of Education, as appropriate.
4. Incorporation of the Standardized Emergency Management System into all school plans, training, exercises, and response during actual disasters.
5. Documentation of the use of SEMS in planning, training, exercising, and during actual disasters.

Conclusions

First, schools and universities should include preparedness against acts of terrorism in their emergency planning, so that all of the personnel who have emergency responsibilities in a disaster are aware of their roles in this type of event. All administrators should review their disaster planning to insure that they have a plan which is appropriate both for their location and local conditions and also includes terrorism aspects. What are the local natural hazards — hurricanes, floods, earthquakes, or whatever? Weapons of mass destruction, cyber-terrorism, arson and bombs should also be considered. What are the cost-effective actions which might be taken now to reduce potential damage in the future from natural hazards and terrorism. Planning for terrorism incidents should also address other complicating issues. A terrorist incident with a nerve gas may suddenly have people collapsing, so that the first responders need to have personal protection. There also may be a possibility of a secondary explosive device rigged to injure the first responders who arrive to rescue the original victims.

Second, school and university security administrators should talk to the local fire, police and emergency management agency and ask them to come and inspect their facilities. The police may have suggestions as to what might be done such as roving patrols to increase campus security at night to deter arson, installing burglar alarms in science laboratories and computer labs, installing motion-sensing lighting outside buildings, etc.

Third, the campus administrators should contact the FBI and discuss their concerns. Talk to the nearest FBI office and find out what the FBI would like the administrators to do. For example, the FBI needs to be notified as soon as possible and needs local help to preserve the 'crime scene' until they get there. As a matter of fact, disaster plans and training might include procedures to be followed concerning telephone bomb threats such as put out by the University of California, Davis, reference (23). It is suggested that, 'When a bomb threat is received over the telephone, the person taking the message should keep the caller talking as long as possible and make written notes of the following: the time and date of the call; the assumed age and sex of the caller; any distinguishing speech characteristics; what was said by the caller as precisely and completely as possible; any background noise that may help identify the source of the call; and the phone number of the caller (if your phone is equipped with this function).

References & Notes

1. FBI Policy and Guidelines: <http://www.fbi.gov/contact/fo/jackson/cntrterr.htm>
2. AFT Type of Incident: <http://www.aft.treas.gov/pib/fire-explo_pub/eir/type.htm>
3. ATF Targets: <http://www.atf.treas.gov/pub/fire-explo_pub/eir/targets.htm>
4. ATF Motives: <http://www.atf.treas.gov/pub/fire-explo_pub/eir/motive.htm>
5. ATF Juvenile Bombing Incidents 1992-1996: <http://www.atf.treas.gov/pub/fire-explo_pub/eir/juvenile.htm>
6. ATF Explosive Incidents by State 1997: <http://www.atf.treas.gov/aexis2/qbystate.html>
7. AFT Bombing Incidents by Target 1997: <http://www.atf.treas.gov/aexis2/qbytarget1.html>
8. ATF Bombing Incidents Fatalities by Target 1997: <http://www.atf.treas.gov/aexis2/qbyfatals1.html>1
9. ATF Bombing Incidents by Motive 1997: <http://www.atf.treas.gov/aexis2/qbynotive.html>1
10. AFT Investigated Fires 1993 to 1997: <http://www.atf.treas.gov/aexis2/qbyarson.html>
11. Church Arson: <http://www.atf.treas.gov/press/fy00press/021000ncatf3rd.htm>
12. Abortion Clinics: <http://www.atf.treas.gov/explarson/abort_clinc.htm>
13. Carus, W. Seth, 'Bioterrorism and Biocrimes' National Defense University, Center for Counterproliferation Research working paper, 1998. Also see <http://www.bens.org/pubs/srbioterr.html>
14. Time, 26 July, 1976, 'Escape from an Earthen Cell'
15. School Shootings: <http://www.abcnews.go.com/sections/us/DailyNews/schoolshootings990420.html>
16. Terrorism Incidents at Universities: <http:www.unabombertrial.com/timeline/index.html>
17. Arson Incidents at Universities: <http://pongo.colorado.edu/police/compare.html>
18. National Defense Preparedness Office: < http://www.ndpo.gov>
19. The Katz Act of the California Education Code (Sections 35295-

35297)
20. 'School Emergency Response: Using SEMS at Districts and Sites.' California Governor's Office of Emergency Services, Sacramento, California, June 3, 1998
21. State of Georgia Senate Bill 74 required all schools to prepare school safety plans. Article 27 of Chapter 2 of Title 20 was amended to insert a new Code Section 20-2-1185 in the Official Code of Georgia. <http://www2.state.ga.us/Legis/1999_00/leg/fulltext/sb74.htm>
22. The Petris Bill of the California Government Code (Section 8607)
23. Bomb Threat: <http://police.ucdavis.edu/bomb.html>

Epilogue

I am now 92 years old. Looking back I have lived an eventful life personally, and I grew up during an interesting time in history. The United States grew up with me from a second tier country during World War I to the position it holds today.

Even more interesting, to me, has been the explosion of technology that has occurred during my lifetime and my front row seat on many of these developments. I have had the opportunity to tour the globe, living and working in North America, South America, Asia, and Europe. I also had a chance to work with some of the greatest names in science of the twentieth century, starting at MIT in the 1930s up until today.

I've had the good fortune to be on the leading edge of the development of four different professions during my lifetime. First I was a registered professional Electrical Engineer during the 1930s and 40s before the transistor was invented. The radar and Identification Friend or Foe (IFF) projects that I worked on still have applications today for every single aircraft that flys with a transponder for air traffic control.

Military Operations Research (OR) was a fledgling field when I joined the profession right after World War II. The B-52s still flying for Strategic Air Command carry one defensive gun in the tail because of my input. During the four decades I was active in OR I helped lay the ground work for analysis techniques still used in this field.

Information Science was a field that developed alongside the invention of the computer. Being in on the ground floor at MIT, and continuing up through my Ph.D. from the City University in London, I was an active member of the scientific community focused on information retrieval and predicting the productivity of authors in the pre-internet era.

But Disaster Management became my main love. It developed as a profession during my lifetime and once again

I was in on the ground floor. I am glad that I was at the right place at the right time to be one of the first Certified Emergency Managers (CEM) in the country. My papers and contributions to international conferences all over the world have been a source of pride for me, and have contributed to the spread of knowledge about ways to manage disasters effectively in the future.

One piece of advice I can offer based on my 92 years of experience is to become a volunteer on worthwhile projects to help others. I have found enormous personal inner satisfaction in volunteer work, beginning as a Boy Scout, when we were told to try to do one good deed every day and had to report the deeds at our weekly meetings. Besides working at the local level in disaster preparedness at the local level in Pacific Grove, I feel very rewarded from being an international proponent of disaster preparedness through my volunteer work on Vice-President Gore's Global Disaster Information Network (GDIN). As a State Department volunteer, I presented papers in Mexico, Turkey, Iceland, and England about how developed countries could help less developed countries with disaster preparedness with the potential to save thousands of lives. The theme was "the right information, at the right time, at the right place" and helping people to listen and then do what would be feasible action for them to prepare. I'm currently a volunteer advising the Afghanistan National Army on disaster plans, particularly earthquakes.

When I was a young boy growing up on Army bases around the world I did not anticipate being recognized in *Who's Who in America, Who's Who in the World,* and *Who's Who in Science and Engineering.*

I am very happy to finally come to the end of this memoir. It has been a labor of love for the last seven years, but now it is done.

As I wrap up this project, it comes just in time as I have other things I need to do now. I have been asked to give a talk in a Living History Symposium at California State University, Monterey Bay in a few weeks. The topic is World War II, and

I intend to talk about research and development of Radar and IFF.

Once that is behind me I'm looking forward to more disaster consulting projects, helping the Afghan Army with their new disaster planning, and promotion activities for my book when it is published near the end of the year. It has been a great run so far, but it's not over yet. My children are encouraging me to write a second volume of memoirs to come out on my 100th birthday. If I'm going to do that I better get busy as I only have eight years to do some more things worth writing about.

Appendix

Appendix A Resume of Russell C. Coile

RUSSELL C. COILE, Ph.D, PE, FICDDS
Certified Emergency Manager
www.DisasterMan.com

EDUCATION:
S.B., S.M. and E.E. degrees in Electrical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts
Ph.D in Information Science, The City University, London, England
Graduate of Senior Officers Course, Naval War College, Newport, Rhode Island
Graduate of Air University, Maxwell AFB, Alabama: Squadron Officer Course; Command & Staff Course; Air War College.

PROFESSIONAL CERTIFICATION / REGISTRATION:
Certified Emergency Manager (International Association of Emergency Managers)
Professional Engineer (District of Columbia PE-1108)
Professional Engineer (PennsylvaniaPE-012126-L)
Fellow, Institute of Civil Defence and Disaster Studies, London, England
Colonel, U.S. Air Force (Retired)

EXPERIENCE:

Disaster Preparedness Coordinator, Sand City Police Department, Sand City, CA May 2003–present

Director of Emergency Services, American Red Cross, Carmel By-the-Sea Chapter, Carmel, California November 2000 to November 2001

Adjunct Professor, Institute for Joint Warfare Analysis, Naval Postgraduate School, Monterey, California, May 1998 to May 2000. Assisted in research on development of models of response by local governments to acts of terrorism involving chemical-biological weapons of mass destruction.

Disaster Coordinator, Pacific Grove Fire Department, City of Pacific Grove, January 1990 to October 2000. Responsible for disaster preparedness for the City of Pacific Grove. Duties included: Initiating emergency preparedness programs, Revising and updating the City's Multi-Hazard Emergency Plan, Designing the City's Emergency Operating Center, Writing Emergency Operating Center Standard Operating Procedures, Planning and conducting the City's exercises such as the participation in the annual statewide earthquake exercise each April, Conducting public education programs, Writing the City's Radio Amateur Civil Emergency Service Plan, Organizing local amateur radio operators in the City's RACES group, Teaching and organizing the City's Volunteers in Preparedness (neighborhood emergency response teams), and Training all City employees in the State's Standardized Emergency Management System (SEMS).

Senior Scientist, VRC Corporation (formerly Evaluation Technology, Inc.), Monterey, CA. Research on command and control systems, total quality management, and test and evaluation. Research on mass transit system emergencies.

Deputy Executive Director/Chief Scientist, Planning Research Corporation, Fort Ord, California. Management of a 200 person ($10 million dollar) contract with the U.S. Army to administer the Scientific Support Laboratory of the Combat Developments Experimentation Center at Fort Ord and Fort Hunter Liggett, California.

Senior Scientist, KETRON, Inc., Arlington, VA. Research on U.S. Navy command and control communications systems. Research on emergency operations centers both aboard ships and at shore headquarters.

Operations Research Analyst, Office of Naval Research funded Operations Evaluation Group at the University of Rochester; Franklin Institute; & Massachusetts Institute of Technology. Military operations research experience working for several universities which had Office of Naval Research grants to design and evaluate exercises for the Navy, Marine Corps and Army. Assisted in research on the design of emergency operating centers and participated in training exercises at various Air Force and Navy headquarters.

Broadcast Station Design Engineer, Colton & Foss, Washington, D.C. Working for a consulting engineering firm designing AM and FM radio broadcast stations and appearing as an 'Expert Witness' in Federal Communications Commission hearings.

Magnetician, Carnegie Institution of Washington, D.C. Earthquake research at a geophysical observatory at Huancayo, Peru conducting research on earthquakes, lightning, and radio propagation through the ionosphere.

MILITARY EXPERIENCE – Military experience included Reserve Officer training in high school and college. Commissioned as a Second Lieutenant in the U.S. Army Signal Corps Reserve upon graduation from college. Now Colonel, U. S. Air Force (Retired).

AMATEUR RADIO – Amateur radio operator participating in emergency communications at my amateur stations, K6FVH, W3EJK, W1ILE, KC6TUW, KO6IA and currently K6FVH.President - Naval Postgraduate School Amateur Radio Club, 1996. American Red Cross Courses; Introduction to Disaster Services; Shelter Operations; Survey & Damage Assessment; Shelter Management Workshop; Disaster Assistance Team Orientation; Ethics Seminar; Serving the Diverse Community; Local Disaster Volunteers; Living with Earthquakes (Train-the-Trainers); Mitigation; Liaison and Mass Care.

FEMA's EMERGENCY MANAGEMENT INSTITUTE, Emmitsburg, Maryland training courses:
E-200 Disaster Preparedness Seminar, 24-26 Sept 1990
G-120 Exercise Design, (CSTI), 4 Aug 1994
G-130 Exercise Evaluation, (CSTI), 20 Mar 1997
G-230 Introduction to Emergency Management, (CSTI), 17 Aug 1995
G-235 Emergency Planning, (CSTI), 16 Dec 1994
G-241 Basic Skills in Decision Making and Problem Solving, (CSTI), 28 Sep 1993
G-243 Basic Skills in Creative Financing, (CSTI) 30 Apr 1993
G-244 Developing Volunteer Resources, (CSTI), 28-29 November 1995
G-245 Civil Defense: All Hazards Course, (CSTI), 7-11 Dec 1992
G-250.1 State and Local Continuity of Government, (CSTI), 15 Oct 1992
G-385.Disaster Recovery Operations, (CSTI), 8 Jul 1994
G-393 Mitigation for Emergency Managers, (CSTI), 24 Feb 1999

G-606 Standardized Emergency Management System (SEMS) (Introductory Course), (CSTI), 16 Aug 1995
G-611 SEMS Emergency Operations Center Course, (CSTI), 26 Sep 1995
G-612 SEMS Executive
G-623 Instructional Dynamics, (CSTI), 28 Oct 1996
G-630 Advanced Exercise Design, CSTI), 20 Mar 1997
HS-1 Emergency Program Manager, 17 Dec 1990
HS-2 Emergency Preparedness, USA, 15 Mar 1991
HS-3 Radiological Emergency Management, 11 Mar 1992
HS-4 Preparedness Planning in Nuclear Crisis, 14 Dec 1992
HS-5 Hazardous Materials - A Citizen's Orientation, 30 Aug 1993
HS-7 A Citizen's Guide to Disaster Assistance, 9 Dec 1993
IS-8 Building for the Earthquakes of Tomorrow, 24 Oct 1996
IS-12 An Orientation to Community Disaster Exercises,.23 May 1997
IS-195 Basic Incident Command System, 8 March 1999

THE HOME OFFICE EMERGENCY PLANNING COLLEGE, The Hawkhills, Easingwold, York, England; Training courses:Seminar for 'Elected Members' 10-12 Sep 1993.

AMERICAN RED CROSS ACTIVITIES

Co-Chairman, Tri-County Community Disaster Preparedness Committee
Member, Board of Directors, Northern California Disaster Preparedness Network
Amateur Radio communications volunteer at KR6ML, Carmel-by-the-Sea Chapter of the American Red Cross.

Appendix B Disaster Response and Preparedness Papers

DISASTER RESPONSE & PREPAREDNESS PAPERS & PRESENTATIONS

How Well Are Schools Prepared for Terrorism. Russell C. Coile and Hector Gonzales. Paper presented at Emergency Response 2004 Conference, November 19, 2004, San Diego, CA

Lessons From Disasters: What Policy Leaders Need To Know, Russell C. Coile. League of California Cities, 2004 Mayors and Council Members Executive Forum, July 29, 2004, Monterey, CA

Preparedness for Terrorism in Schools. Russell C. Coile. Poster paper presented at the 14th World Conference on Disaster Management, June 20-23, 2004, Toronto, Canada

Citizen Corps Volunteers to Prepare for and Respond to Terrorism and Natural Disasters — Russell C. Coile. Paper presented on May 16, 2002 at the 9th World Conference on Emergency Management, The International Emergency Management Society, University of Waterloo, Waterloo (Toronto), Canada

Citizen Corps Volunteers — Russell C. Coile. Paper on the Internet at UN/ISDR Earth Summit 2002 Debate: Building Partnerships for Sustainable Development, Week 3 (29 April — 2 May 2002) http://www.earthsummit2002.dyndns.org/pages/debate_intro.cfm

Disaster Education for Children — Russell C. Coile. Paper on the Internet at UN/ISDR Earth Summit 2002 Debate: Building Partnerships for Sustainable Development, Week 4 (6 May — 9 May 2002) http://www.earthsummit2002.dyndns.org/pages/debate_intro.cfm

Contributions of Disaster Information Organizations to the World Agency of Planetary Monitoring - Russell C. Coile, Director of Emergency Services, American Red Cross, Carmel Chapter, Carmel, California. Paper presented at the Founding Conference of the World Agency of Planetary Monitoring

and Seismic Prediction, Geneva, Switzerland, May 5, 2001.

Terrorism and School Violence - Russell C. Coile. The ASPEP Journal 2000, pages 99-107, American Society of Professional Emergency Planners, Falls Church, Virginia, November 2000.

Disaster Information for Emergency Management - Russell C. Coile. Paper presented at Disaster Forum 2000, Edmonton, Alberta, Canada, November 3, 2000.

October 2000 Progress Report: Small Communities Working Group of the Global Disaster Information Network (GDIN) - Russell C. Coile and Patricia Jocius. Pre-GDIN

2001 document prepared for March, 2001 GDIN Conference, Canberra, Australia. http://www.gdin-international.org/wg/smcomm_progress.html

How GDIN Might Help Local Communities - Russell C. Coile. Poster paper presented at the First International Global Disaster Information Network (GDIN) Information Technology Exposition and Conference, Honolulu, Hawaii, October 9-11, 2000.

The Certified Emergency Manager program sponsored by the International Association of Emergency Managers - Russell C. Coile. Poster presentation at Fourth Local Authorities Confronting Disasters and Emergencies (LACDE) 2000 Conference, Reykjavik, Iceland, August 27-30, 2000.

Local Government Virtual Working Group of the Global Disaster information Network - Russell C. Coile. Poster presentation at Fourth Local Authorities Confronting Disasters and Emergencies (LACDE) 2000 Conference, Reykjavik, Iceland, August 27-30, 2000.

Emergency Response: Terrorism and Schools - Russell C. Coile. Paper presented at the Biological and Chemical Weapons Curriculum Workshop, Center for Nonproliferation Studies, Monterey Institute of International Studies, Monterey, California, July 27, 2000.

Report of Working Group 2, How a GDIN might Engage or Help Local Communities, especially those with Poor Communication Capabilities

- Russell C. Coile. Paper presented at the GDIN Conference, Mid East Technical University, Ankara, Turkey, April 27, 2000. http://www.gdin-international.org/ankara/coile.doc

Disaster Information Networks — Russell C. Coile. The ASPEP Journal 1999, pages 71-81, American Society of Professional Emergency Planners, Falls Church, Virginia.

Pacific Grove Fire Department's Public Education and Professional Outreach Programs for Disaster Preparedness — Russell C. Coile. Partnerships in Preparedness: A Compendium of Exemplary Practices in Emergency Management, Volume IV page 10, November 1999, Federal Emergency Management Agency, Washington, DC. http://www.fema.gov/pte/partners_v4.pdf

Progress on the Development of the Global Disaster Information Network — Russell C. Coile. Poster session paper PS99-5 at the 1999 Natural Hazards Research and Applications Workshop, University of Colorado, Boulder, July 11-14, 1999.

Natural Disaster Reduction Efforts at the Local Government Level in the United States - Russell C. Coile. Paper presented at the annual conference of The International Emergency Management Society, Delft Technical University, The Netherlands, June 10, 1999. (Paper published in Proceedings of TIEMS '99).

Role of Local Communities in Disaster Information Networks - Russell C. Coile. Paper presented at the International Conference on Information Systems for Disaster Management, Plenary Session 3 (May 12, 9:00-10:30 am), How a GDIN might Engage or Help Local Communities, especially those with Poor Communication Capabilities, Mexico City, Mexico, May 12, 1999. http://www.state.gov/www/issues/relief/coile.html

Disaster Information Requirements of the City of Pacific Grove, California — Russell C. Coile. Users Conference '99, Pacific Disaster Center, Kihei, Maui, Hawaii, April 28-30, 1999

Preparing for and Coping with Local Disasters; An Information Overlay — Russell C. Coile. Paper presented at Pacific Intelligence Forum (PACINTEL

'99), Monterey, California, February 9, 1999.

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Disaster Preparedness for the City of Pacific Grove — Russell C. Coile. 1998 California Cities Helen Putnam Award for Excellence in Category: Public Safety, Certificate of Honorable Mention, League of California Cities, September 11, 1998.

Exercises for Modeling Response by Local Authorities to Chemical-Biological Terrorism - Gordon S. Schacher, Xavier Maruyama and Russell C. Coile. Poster session paper PS98-22 at the 1998 Natural Hazards Research and Applications Workshop, University of Colorado, Boulder, July 12-15, 1998.

Chinese Research on Earthquake Forecasting — Russell C. Coile. Poster session paper PS98-5 at the 1998 Natural Hazards Research and Applications Workshop, University of Colorado, Boulder, July 12-15, 1998.

Baseline Exercise for Chem-Bio Terrorism Response: Pacific Grove Multi-Casualty Incident Drill, November 1997 - Gordon S. Schacher, Xavier Maruyama and Russell C. Coile. Paper presented at the FBI/State OES Bay Area Terrorism Working Group meeting, San Jose, California, July 9, 1998

Disaster Preparedness For Children — Russell C. Coile. Paper presented at Disaster Forum '98, Edmonton, Alberta, Canada, June 29, 1998.

Multi-casualty Incident Exercise: Modeling, Data Acquisition, and Parameters — Gordon E. Schacher, Xavier K. Maruyama, Russell C. Coile.

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Neighborhood Emergency Response Teams For Community Outreach - Russell C. Coile. Poster session paper PS95-4 at the 1995 Natural Hazards Research and Applications Workshop, University of Colorado, Boulder, July 16-18, 1995.

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Recent Disasters In California - Russell C. Coile. Paper presented at the Institute of Civil Defence and Disaster Studies Annual Study 'International Civil Protection Preparedness and Response to Major Disasters' at the Home Office's Emergency Planning College, Easingwold, Yorkshire, England, June 17-19,1994. (Published in the Final Report of the Institute of Civil Defence and Disaster Studies Annual Study, June 17-19,1994 'International Civil Protection Preparedness and Response to Major Disasters', Institute of Civil Defence and Disaster Studies, Bell Court House, 11 Blomfield Street, London, EC2M 7AY, England).

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Oil Spill! - Russell C. Coile, author, producer, & director. Play to dramatize and help wildlife rescue volunteers visualize how they should fit into the Incident Command System. Play presented by a cast of 22 volunteers of the California Ocean Assistance Spill Team to Friends of the Sea Otter, at Ohlone School, Hillcrest Road, Watsonville, California, March 20, 1993.

Disaster Preparedness - Russell C. Coile. Paper presented at Joint National Meeting, Operations Research Society of America (ORSA)/ The Institute of Management Science (TIMS), San Francisco, California, November 2, 1992.

Appendix C Professional Papers and Presentations

PROFESSIONAL PAPERS and PRESENTATIONS

'The Parabolic Sound Concentrator.' Paper presented at the Tenth Anniversary meeting, Acoustical Society of America, New York, NY, May 1939. Abstract in Journal of the Acoustical Society of America, Vol. 11, p. 167, July 1939. Published as 'Parabolic Sound Concentrators', Journal of the Society of Motion Picture Engineers, Vol. 51, No. 3, pp. 298-311, September 1948. Summary in The Eavesdroppers by Samuel Dash, Richard F. Schwartz, and Robert E. Knowlton, pp. 347-349, Rutgers University Press, New Brunswick, NJ, 1959.

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Defense Conference, Washington, D.C., Secret OEG(LO)2249, 7 January 1949.

OEG Study No. 380 (Title Classified). Secret, 15 March 1949.

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'Naval Guided Missiles (U).' National War College seminar discussion leader, Washington, D.C., Secret, 18 April 1949.

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'Operations Research in Korea (U).' Lecture at the Naval Postgraduate School, Annapolis, MD, 26 September 1951.

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'Organization of Operations Research Groups.' Lecture presented to the Navy Section MAAG - Japan, Tokyo, Japan, February 1956.

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'Marine Corps Guided Missile Tests (U).' Paper presented at the Institute for Defense Analyses (IDA), Washington, D.C., Secret, 18 October 1965.

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'Helicopter Operations in Ground Combat (U).' Chairman of Working Group, 17th Military Operations Research Symposium (MORS), U.S. Naval Postgraduate School, Monterey, CA, Secret,23-25 May 1966.

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'Joint Task Force-116 Operations (U).' Paper presented to the Joint Forces Working Group, 21st Military Operations Research Symposium (MORS), Air

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'A New Application of Computers for Information Scientists.' The Information Scientist, Vol. 9, No. 4, pp. 149-152, December 1975.

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'Antisubmarine Warfare in the Mediterranean (U).' Center for Naval Analyses Seminar, Arlington, VA, Secret, 19 February 1976.

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'AAW Missile Systems Performance in Fleet Exercises (U).' Center for Naval Analyses Seminar, Arlington, VA, Secret, 17 February 1977.

'Results of Missile-Firing Exercises, 1970-1976 (U).' Paper presented at the Operations Evaluation Group/Center for Naval Analyses Surface Warfare Conference, Arlington, VA, Secret, 3 May 1977.

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'Error Detection in Computerized Information Retrieval Data Bases.' Paper presented at the Sixth Cranfield International Conference on Mechanized Information Storage and Retrieval Systems, Cranfield, Bedford, MA, 29 July 1977, NTIS AD-A043 580.

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'Lotka's Frequency Distributions of Scientific Productivity.' Journal of the American Society for Information Science, Vol. 28, No. 6, pp. 366-370, November 1977.

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'Analysis of Equipment Failures' - R.C.Coile. Paper presented at the Escola Nacional de Ciencias Estatisticias, Rio de Janeiro, Brazil, October 29, 1980.

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'An Application of the Negative Binomial Distribution to Analysis of Equipment Failures - R.C.Coile. CDEC Scientific Support Laboratory seminar, Fort Hunter Liggett, CA, May 11, 1983, and Fort Ord, CA, May 20, 1983.

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'Analysis of Naval Exercises - R.C.Coile. Lecture at the U.S. Naval Postgraduate School, Monterey, CA, October 28, 1983.

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'Analysis of NATO Exercises' - R.C.Coile. Lecture at the U.S. Naval Postgraduate School, Monterey, CA, April 10, 1986.

'Application of Sichel's Generalized Inverse Gaussian-Poisson Distribution to Problems of Bibliometrics and Reliability - R.C.Coile. Paper presented at the Joint National Meeting of The Institute of Management Sciences and the Operations Research Society of America, Los Angeles, CA, April 15, 1986

'Test and Evaluation of Battlefield Robotics - R.C.Coile. Paper presented at the 54th Military Operations Research Society (MORS) symposium, National Defense University, Fort McNair, Washington, D.C., June 24, 1986.

'Test and Evaluation - R.C.Coile. Lecture at the U.S. Naval Postgraduate School, Monterey, CA, October 6, 1986.

'The Role of Test and Evaluation in Defense Resources Management - R.C.Coile. Lecture presented at the Defense Resources Management Education Center, Monterey, CA, April 10, 1987.

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'Planning for Mass Transit System Emergencies' - R.C.Coile. Paper presented at the Joint National Meeting of The Institute of Management Sciences and the Operations Research Society of America, Denver, CO, 23 October 1988.

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'Infantry Effectiveness in Battle: Analysis of Defeats' - R.C.Coile. Unclassified paper presented in Working Group 17, 60th Military Operations Research Symposium (MORS), Naval Postgraduate School, Monterey, CA 25 June 1992

'Operational Research in the Field' - RC.Coile. Paper presented at the Ninth International Symposium on Military Operational Research, Royal Military College of Science, Shrivenham, Swindon, Wiltshire, U.K., September 9, 1992

About the Author

Russell C. Coile, Ph.D, CEM is a Certified Emergency Manager awarded lifetime CEM status by the International Association of Emergency Managers. He is an international disaster consultant who has lived and worked on numerous disaster problems in various parts of the world. He is listed in *Who's Who in America, Who's Who in the World,* and *Who's Who in Science and Engineering*.

Dr. Coile was born in Washington, DC. He has lived for three years in Panama, two years in Peru, one year in Brazil, one year in Japan, one year in Italy, and three years in England, plus more than a year in each of the following states: Delaware, Virginia, Maryland, Rhode Island, Massachusetts and California.

Dr. Coile was the Emergency Program Manager at the Pacific Grove, California Fire Department for ten years, and is now the Disaster Preparedness Coordinator at Sand City, California Police Department.

BIOGRAPHY/AUTOBIOGRAPHY/MEMOIR

Emergency Management has emerged as a profession in the last thirty years. Russell Coile's career as one of the country's first Certified Emergency Managers (CEM) parallels its development, building on his background in electrical engineering, operations research and information science. He is one of the first managers awarded Lifetime status by the International Association of Emergency Managers.

After high school in Honolulu and three engineering degrees from MIT, Coile chronicles his life and work during three years in Panama, two years in Peru, one year in Brazil, one year in Japan, one year in Italy, and three years in England, plus many years in the states of Delaware, Virginia, Maryland, Rhode Island, Massachusetts and California.

This book features examples of scientific papers and published articles representing key research projects from every phase of his career, including disasters such as earthquakes, tsunamis and floods. Photographs document his family story.

Russell C. Coile, Ph.D's life story parallels the development of disaster management as a profession, after forty years of pioneering work in electrical engineering, operations research, and information science. He is a Certified Emergency Manager who has lived and worked on five continents.

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