Vol 8, No 1

April 1997

Table of Contents:

THE ARMY AND THE GREAT SAN FRANCISCO EARTHQUAKE

By Richard L. Cook
Earthquake Preparedness Center of Expertise

Ninety-one years ago this month. It sounds like an eternity but the events of that year will never be forgotten.

At 5:12 a.m. on April 18, 1906 a foreshock struck with sufficient force to be felt throughout the San Francisco Bay area. About 20 to 25 seconds later the great earthquake broke loose. There were violent shocks and strong shaking that lasted for some 60 seconds a lifetime when going through an earthquake. It was felt from southern Oregon, to the south of Los Angeles and as far as central Nevada. It had a magnitude of about 7.8 and the epicenter was near San Francisco. The 1906 San Francisco earthquake released approximately 16 times more energy than the 1989 Loma Prieta earthquake in California. The quake ruptured the northernmost 430 kilometers of the San Andreas fault from northwest of San Juan Bautista to the triple junction at Cape Mendocino and caused large horizontal displacements.

The frequently quoted number of 700 deaths caused by the earthquake and fires is now believed to be underestimated by a factor of 3 or 4, with most of the fatalities occurring in San Francisco and 189 elsewhere.

Lets look now at the roles of the U.S. Army following the earthquake. The July 1906 Cosmopolitan Magazine published an account of Brig. General Frederick Funston who was the Commanding Officer of the Troops at the Presidio of San Francisco at the time. It related the Army's role in helping firemen, patrolling the city, saving lives, caring for the wounded and feeding the hungry and other tasks performed. It did not relate how the Army fought to save the city using dynamite, and the numberless instances of lives saved and hungry mouths fed are downplayed by him. As Cosmopolitan Magazine said "Modesty is written on every page of this report".
At the time of the earthquake there were ten companies of Coast Artillery; the 1st, 9th, and 24th

Batteries of Field Artillery; the entire 22nd regiment of Infantry; Troops I, K, and M,14th Cavalry; and Company B, Hospital Corps stationed at military posts on or near San Francisco. These units had approximately 1,700 soldiers in them.

The headquarters of the Pacific Division and of the Department of California were located in buildings in the heart of the city, and the officers on duty lived in the city, not at the army posts. The commander of the Pacific Division (Major General A.W. Greely) was in Washington when the quake struck and Brig. General Funston was the senior officer in command until he returned.

General Funston lived at 1310 Washington Street, which was one of the most elevated parts of the city. He and his family were awakened at 5:16 a.m. by the earthquake shock. Due to the street-car system being severely damaged, he went on foot toward the business section of the city to see what damage had been done. When he arrived at the highest part of California Street (Nob Hill), he saw several columns of smoke coming from the area south of Market Street and others from the banking district. He then walked down California to Sansome Street where he found several fires burning fiercely and saw that the fire department was helpless due to water-main destruction.

Seeing that the city police would not be able to maintain the fire lines and protect public and private property he decided to put out an order to all available troops, not only to protect federal buildings, but to aid the police and fire departments.

Due to the lack of communications, he made his way from Sansome Street to the army stable on Pine, near Hyde which was about a mile away. There, he wrote a note to Colonel Charles Morris, Artillery Corps, who was the commanding officer at the Presidio, directing him to report with his entire command to the chief of police on Portsmouth Square. This he gave to his driver to carry by horseback to the Colonel. He also passed on a verbal message with the same information to Captain M.L. Walker, Corps of Engineers, in command at Fort Mason. Both Colonel Morris and Captain Walker had their commands well in hand and responded immediately upon notification.

General Funston then walked to his home, instructed his family to pack up and evacuate the house, then walked to the Phelan Building which was the headquarters of the Department of California where he found several officers of the Pacific Division and the Department of California waiting for him.

Just before 7 a.m. the first detachment of regular troops, the men of the Engineer Corps at Fort Mason, arrived. They were greeted with good will by the crowd and made a fine impression with their full cartridge-belts and fixed bayonets. They had marched from Fort Mason to report to the chief of police, as instructed, and were at that time being distributed along Market Street, with instructions to shoot instantly any person caught looting or committing any serious misdemeanor.

It was decided then to bring the battalion of the 22nd Infantry stationed at Fort McDowell, on Angel Island, to the city. Since all communications were cut off, the large Army tug “Slocum” was dispatched to that fort with orders to Colonel A. Reynolds to embark his command at once, land at the foot of Market Street and march to the Phelan Building.

Army clerks and messengers who had reported for duty set about saving the records of the offices on the floor, placing them in wagons and transporting them to Fort Mason.

By this time, troops from the Presidio began to arrive - cavalry, coast artillery armed and equipped as infantry, and field artillerymen mounted on their battery horses.

Tens of thousands of people were kept at a distance of two blocks from the fires by strong

detachments of troops.

Before 10 a.m., the troops from Forts McDowell and Miley arrived, and there were at that time some 1,700 regulars on duty. They were used to guard the people, the Treasury and the Mint, to patrol the streets to prevent looting, maintain fire-lines, and to take a hand at fire hoses wherever there was sufficient water pressure.

The officers of the troops consulted the officers of the police and fire departments and complied with their wishes in every possible way. There was absolutely no friction to be seen between them. Dynamite was obtained, and buildings were blown up at the direction of the fire and police officials. This work was mainly done by Captain Coleman and Lieutenant Briggs, Artillery Corps. The amount of dynamite available was too small to accomplish much, so a tug was obtained and a number of trips were made to the works of the California Powder Company at Pinole.

Lieutenant Pulis of the Artillery Corps was seriously injured by a premature explosion during this effort. Frame and old brick buildings were reduced to rubble but the more modern steel and concrete structures stood even with large charges set at them.

General Funston, Mayor Schmitz and Chief of Police Dinan decided that regular troops should patrol the wealthy residence district west of Van Ness Avenue, to prevent robbery or disorder by the groups of people driven there by the progress of the fires. For this duty, General Funston placed all troops in the city under the command of Colonel C. Morris, Artillery Corps.

During the night, the Grant Building, headquarters of the Pacific Division and the Phelan Building, headquarters of the Department of California, burned down. The officers on duty in the city assembled and reestablished headquarters at Fort Mason at the north end of Van Ness Avenue.

The Pacific Squadron, under the command of Admiral Goodrich, arrived from the south and landed several hundred marines and sailors, who fought the fires and aided in patrolling the streets.

Every hotel, bank, and large store had been destroyed, 300,000 people were homeless, and thousands more were left without the means of livelihood.

The rations, tents, and blankets on hand at the army posts adjacent to the city were dealt out to the sufferers with no account of the responsibility involved. Within two days, relief supplies from neighboring states and cities and army supplies from various army posts had begun to arrive and were being distributed under the supervision of Major C.A. Devol, depot quartermaster, and Major C.R. Krauthoff, depot commissary.

The sick from the city hospitals and many of the injured were sent to the general hospital at the Presidio.

In a few days conditions were as normal as could be expected under the circumstances, and the work of feeding and sheltering the homeless thousands proceeded in a systematic manner.

There was very little panic and no serious disorder. Those who would have taken advantage of the situation were kept in check by the soldiers with magazine rifles, fixed bayonets, and belts full of cartridges. There was no necessity for the regular troops to shoot anyone and there is no well-authenticated case of a single person having been killed by regular troops.

General Funston made a statement after the earthquake that is so important to remember and take heed from: "If there is any lesson to be derived from the work of the regular troops in San Francisco, it is that nothing can take the place of training and discipline, and that self-control and patience are as important as courage."

Let us not only remember what damage the 1906 San Francisco earthquake produced, but learn from it and other

earthquakes since that time. We must all stress preparedness for disaster. It can and will happen again. The more we prepare, the more lives we can save.

If you would like to read more about the great 1906 San Francisco earthquake, the roles of the Army, or eyewitness accounts of the quake, please let me know and I will be happy to pass on more information. Simply drop me a line at the return address of this publication.

****

URBAN SEARCH AND RESCUE TEAMS A CAVALRY OF RED COATS TO THE RESCUE

By Gerry Arbios
Public Affairs, Seattle District, U.S. Army Corps of Engineers

Seattle District received some new disaster response missions this past winter — a winter where the snow came to Idaho and Montana and did not know when to quit.

Mr. Norm Skjelbreia, trained as an Urban Search & Rescue (US&R) structures specialist, took an emergency response team made up of three squads of structural engineers and structures specialists, to Idaho on January 7 to help out in the aftermath of three months of snowfall. President Clinton had already declared disasters due to severe winter storms, flooding, mud and land slides in 13 counties.

One squad was assigned to each of Idaho's Bonner, Boundary and Shoshone counties who had requested FEMA help to inspect the structural integrity of schools and other public buildings where the high snow load was causing weight problems on the roofs. A structures specialist was assigned to each squad and all the Corps employees came with experience in building design, construction or evaluation. The squads inspected 31 school buildings designated by the school districts and 15 other public service buildings. After evaluating each structure, they would determine whether the structure was safe or unsafe, or whether limited entry was allowed.

In addition to the inspections, another team came over and directed the snow removal from the building roofs and from the access roads around the building, and an engineer from Albeni Falls Project directed the removal of debris and snow from four Forest Service access roads in Bonner County.

Closer to Seattle, Snohomish County in Washington called FEMA and the Corps for help in late January when it was faced with overwhelming problems with urban flooding, slope stability, public health and safety issues after the snow and rain hit the first of the year. Snohomish County's call for emergency assistance was coordinated through the state/FEMA Disaster Field Office on late Friday afternoon and Seattle District's emergency volunteers were on-site in a "cavalry of red coats" Saturday morning at 8 a.m. sharp.

In Snohomish hundreds of families and businesses were flooded out by all the water that had accumulated during the new year storms. Inundated with requests to investigate and assess damage to or related to public facilities and identify problem areas that needed immediate county help, the county turned to FEMA and asked for the Corps. The urban flood team of eight was handed more than 200 requests for assistance when they arrived. On Super Bowl Sunday, four

more employees joined the team, and by the end of the project, there were 14 volunteers on site.

The quick turnaround on their call for assistance helped the county sort out and prioritize what emergency jobs they had to tackle first. For an urban rescue type of project, speed in responding is a crucial ingredient, whether it's snow, fire, flooding or earthquakes.

The Corps put together engineering support teams in 1992 to meet its requirements to support DoD as the lead agency under the Federal Response Plan's Emergency Support Function #9 — Urban Search and Rescue, subsequently transferred to FEMA in 1994. The US&R cadres are trained and certified under the Earthquake Preparedness Center of Expertise (EQPCE) training program according to FEMA standards. The teams consist of structures specialists and technical search specialists. A structures specialist needs a minimum of five years of engineering experience of basic construction techniques for wood, masonry, concrete and steel who is then trained to support FEMA S&R Task Forces and local jurisdictions as part of a component that analyzes collapsed buildings and designs shoring systems to stabilize structures for rescuers to gain safe entry.

Technical search specialists (TSS) can come from a variety of backgrounds — civil engineers, environmental engineers or engineering technicians — who are also trained by the EQPCE . Their goal is to guide a rescue team as close as possible to the location of a live victim. The TSS also works with an electronic listening device called a STOLS unit —System to Locate Survivors — which was developed by Dr. Richard Lewis of the Corps' Waterways Experiment Station. Last May, Seattle District's US&R Leader Norm Skjelbreia got a chance to reach into his professional bag of tricks when he accompanied the Snohomish County fire department to a Stanwood, Washington, site where a fire had destroyed a food processing plant, leaving some unstable walls with melted beams. Faced with a tank of hazardous chemicals in a precarious spot, he and the county fire chief or incident commander put together a plan to defuse the problem.

According to Skjelbreia, the need for urban rescuers grows each year. But faced with the cutbacks on funds for training, the teams could face fewer members as experienced employees retire. And good training, along with good experience, is the key to keeping these teams vital and ready when the next catastrophe comes.

[Note: A thank you received by the Commander, Seattle District, for the work in Snohomish County:

Col. Wynn...Just read your Sunday SITREP. Great effort by your team that has been recognized by the State Attorney General and more importantly has identified several life threatening situations. Please pass on my thanks for their superb assistance that drives home the point to the American public that they can count on the Corps! Thanks — Brig. General Robert H. Griffin, Commander and Division Engineer, North Pacific Division]

****

New Technology:
Rescue Rubble Radar Update - The Next Step

By Michael A. Dillabough
Earthquake Preparedness Center of Expertise

As I see it, one of the benefits and challenges of my job is technology transfer. In many ways, trying to nurture a new technology is like raising a young child. As a father of two young children,

I have found myself wishing several times for my son and daughter to start running when they have just mastered walking.

Well, Rescue Rubble Radar (RRR), which I wrote about in the April 1995 edition, has now successfully taken its first steps. Last year, with a modest fund provided by the Corps, work was started on developing a prototype RRR. The heart of the RRR device is the Micro power Impulse Radar (MIR). This is literally a radar on a chip that should be fairly cheap to make once a working model is developed. The work on this device was accomplished by Dr. Waleed Haddad at the Lawrence Livermore National Laboratories in California.

After many frustrating delays and challenges, field tests were held using the prototype RRR device. One item overlooked at the beginning of the program was how difficult it would be to come up with a suitable rubble pile that was fairly close to the lab and safe to use. Most laboratory facilities do not have a rubble and the problem was solved by building one.

The rubble pile was built around a four-foot diameter, four-inch thick concrete pipe. On one side of the pipe two eight-inch thick concrete slabs were leaned against it, one on top of the other. On the other side of the pipe, a couple of dozen concrete parking lot bumpers were piled haphazardly against the side of the pipe. Both concrete floor slabs were built with a six inch grid of number 4 rebar. The concrete pipe reinforcement consisted of number 4 rebar as well. For those readers who are not radar savvy, radar cannot penetrate metal.

So the first challenge for the RRR device was to be able to easily and quickly detect a live victim through at least the two concrete slabs without having to first determine where the steel was within the concrete. The test was conducted on a fairly windy, hot day with Dr. Waleed Haddad, Dr. Steve Azevedo, and myself. First we had to determine what the signal would look like without a victim within the pile. In effect we zeroed in the device.

Next Dr. Azevedo, who volunteered to be our victim, crawled into the pipe and sat still. I was very pleasantly surprised when Dr. Haddad and I were almost able to immediately detect, via the RRR, the breathing pattern of our victim. Several tests later with the victim moving, being still, holding his breath, crawling out of the pipe and back in it, etc., I was confident that I could quickly and easily detect a victim. Even with the victim laying still and breathing as shallowly as possible I could detect him. This was the RRR device's first step.

When we tried to detect the victim through the other side of the rubble pile, we were considerably less success. The signal was so broken up so that neither Dr. Haddad nor I were willing to say that we could detect the victim. Several factors worked against us: the steel within the parking bumpers, the randomly piled bumpers that created countless surfaces to reflect radar waves off of, and the extreme low power of the radar. Dr. Haddad concluded that a slightly more powerful MIR radar would have to be developed for effective use in the urban search and rescue field, (about 1 to 3 watts instead of the fraction of a watt the current prototype uses.) With the increase in power and slight modifications to the MIR, Dr. Haddad believes the RRR will have the ability to penetrate through at least ten to twenty feet of rubble and have the ability to roughly determine the depth of the victim.

Now comes the biggest challenge--how to fund the research required to develop the RRR. An off-the-cuff estimate to redesign and reconfigure the MIR chip, to handle the higher power, and building of a new prototype RRR will cost more than $150,000.

****

FACTS-FOLLIES-MYTHS-FOLKLORE

By Richard L. Cook
Earthquake Preparedness Center of Expertise

There is an enormous amount of information around on earthquakes. Just what is fact and what is fiction in many cases depends on the individual, their culture, religious beliefs, or scientific study.

We do know that an earthquake is the sudden, sometimes violent movement of the earth's surface from the release of energy in the earth's crust. The crust of the earth, when it is subject to tectonic forces, bends slightly. But, because the crust is rigid, when the stress or pressure exceeds the strength of rocks, the crust breaks and snaps into a new position. Vibrations called seismic waves are generated and travel both through the earth and along its surface. These seismic waves cause the movement we call earthquakes.

That gives you an idea of what an earthquake is. Now just to give you an idea of how many earthquakes occur on the average each year, the following shows the frequency of earthquakes of different magnitudes:

Great (8.0 +)	=	1
Major (7.0-7.9)	=	18
Large-Destructive (6.0-6.9)	=	120
Moderate-Damaging (5.0-5.9)	=	1,000
Minor-Damage Slight (4.0-4.9)	=	6,000
Generally Felt (3.0-3.9)	=	49,000
Potentially Perceptible (2.0-2.9)	=	300,000
Imperceptible (less than 2.0)	=	600,000

How can we tell when an earthquake is going to happen? Well, there are many beliefs, theories, and ideas about that also. There are some folks out there that fairly accurately predict earthquakes. Some are downright amazing with their results.

Some say that animals can tell when an earthquake is about to happen. Changes in animal behavior have been observed and documented in some cases. A fish in a high school lab would flip on its side before some earthquakes. Dogs, cats, snakes, and horses have also been known to act strangely before earthquakes. Change in animal behavior can result from other events since behavior is not earthquake specific, so it is impossible to determine beforehand what factor has caused the change. It is also not consistent. Sometimes earthquakes occur with no behavior change.

Does weather have anything to do with the occurrence of earthquakes? Well, in the 4th century B.C., Aristotle proposed that earthquakes were caused by winds trapped in subterranean caves. Small tremors were thought to have been caused by air pushing on the cavern roofs, and large ones by the air breaking the surface. This belief led to "earthquake weather" - that because a large amount of air was trapped underground, the weather would be hot and calm before an earthquake.

A later idea stated that earthquakes occur in calm, cloudy conditions, and were usually preceded by strong winds, fireballs, and meteors. However, it is now usually believed that there is no connection between weather and earthquakes. They are the result of geologic processes within the earth and can happen in any weather and at any time during the day or any season of the year.

How about the ground opening up and swallowing people? This is strictly a myth. Cracks and fissures appearing in the ground are a common effect of earthquakes. Most are narrow and shallow. Changes in the level of the land can result in larger cracks during extremely large earthquakes. These can cause a great deal of damage to buildings but people and buildings do not get swallowed up by the ground. There are no reliable accounts of anyone falling to his or her death in cracks caused by earthquakes.

We can always tell where an earthquake has occurred because we can see the ground on the surface that has moved. Not so! Earthquakes occur on faults, but we can only view those faults on the surface if the rupture which generated the quake extends to the surface. Strong earthquakes can occur without the rupture extending to the surface. The rupture did not extend to the surface in either the 1994 Northridge or the 1989 Loma Prieta quakes in California.

How about - The most shaking in earthquakes occurs next to the epicenter. Fiction! The epicenter is only the point on the surface above the location where the fault begins the slip which generates the earthquake. The epicenter is not synonymous with "ground zero". The fault rupture can be tens of miles long and waves are generated along the entire length of the fault. So, predictions of ground shaking intensities are not based on distances from possible epicenters, but on distances from known faults, or segments of faults, on which large earthquakes are anticipated.

Then there is - If you live on "bedrock" you will be safe from really strong shaking. Wrong again! Shaking can still be severe in areas underlain by bedrock. This is true even though bedrock, particularly rock such as granite, does not amplify the shaking that occurs.

Today we have much scientific data and information available about the cause of earthquakes; however, this was not always the case. In an earlier edition of the "epiCenter News" I did an article about earthquake myths from around the world. A few others that have come to my attention are:

El Diablo, an Indian god, made a giant rip in the ground so that he and his cohorts didn't have to take the long way around, whenever they wanted to stir up mischief on the earth.

The Hindus of India believed that eight mighty elephants held up the land, and when one of them grew weary, it lowered and shook its head, causing an earthquake.

In Kamchatka, Siberia, Russia, a god named Tuli drove an earth-laden sled pulled by flea-infested dogs. When the dogs stopped to scratch, the earth shook.

In Peru, whenever their god visited the earth to count how many people were there, his footsteps caused earthquakes.

To make his job easier, the people ran out of their houses shouting "I'm here, I'm here!" which incorporated into their myth the wisdom of leaving their flimsy houses during an earthquake.

Whatever the belief or theory, the fact is THERE IS A 100 PERCENT CHANCE OF AN EARTHQUAKE STRIKING TODAY! It may be so light that only sensitive instruments will perceive its motion; it may shake houses, rattle windows, and displace small objects; or it may be strong enough to cause property damage, death, and injury. It could hit ANY location because NO region is entirely free of earthquakes.

Earthquakes cannot be prevented, but it is possible to lessen the impact of them. Building structures using earthquake resistant design, making the interiors of buildings safe from falling objects, and educating people about earthquake safety can greatly diminish the amount of devastation from an earthquake. Even though April may only be "Earthquake Preparedness

Month" in California and throughout the U.S. Army Corps of Engineers, we should all consider the consequences of a devastating earthquake. Take the time to look around yourself and see how you can better prepare yourselves and your loved ones. Make every month Earthquake Preparedness Month.

In closing, I would like to give credit to the Center for Earthquake Research and Information (CERI), at the University of Memphis for the information contained in this article. CERI has a wealth of information available, especially on the New Madrid fault system which has the greatest earthquake risk east of the Rocky Mountains.

****

OFF THE SHELF...

By Patricia A. Kuzmiak
Earthquake Preparedness Center of Expertise

o *Scenario for a Magnitude 7.0 Earthquake on the Hayward Fault*

This September 1996 report was produced by the Earthquake Engineering Research Institute (EERI) with support from the Federal Emergency Management Agency (FEMA).

Wherever your threat, much of the material found in this publication can be applied as considerations to other scenarios. Based on insights and issues presented at the 1995 Annual Meeting of EERI, this is a very well-done document that portrays a northern Hayward earthquake scenario from the perspective of sixteen experts in the field, who cover various aspects of the earthquake. Throughout its 109 pages you will find many full-color photographs, maps, charts and diagrams that support the sixteen chapters of material that address the socioeconomic environment and recovery, geology, seismology, ground failure/motion phenomena, effects to infrastructure, including water and sewer delivery systems, building and transportation systems, power, telecommunications, and fuel delivery systems, critical facilities, damage and loss estimation of commercial and residential buildings, emergency response and relief, and regional response issues. The final chapter is "A Call to Action" by L. Thomas Tobin, Tobin & Associates. In borrowing from his comments, I might sum up the value of the document as being as "candid, complete, and well prepared" as its contributors. Facing our vulnerabilities through honest assessments <u>is</u> the only way that progress can be made.

EERI offers copies of this publication for a prepaid charge of $15. Write to EERI, 499-14th Street, Suite 320, Oakland, CA 94612-1934; or phone (510) 451-0905, fax (510) 452-5411, or e-mail to eeri@eer.org. California residents should add 8.25% sales tax. International orders will require an additional charge of $2.50 for shipping.

o *Earthquake Vulnerability of Transportation Systems in the Central United States*

Another U.S. Department of Transportation joint endeavor, this time a September 1996 monograph prepared by the Central United States Earthquake Consortium (CUSEC) with technical support from MS Technology and funding support from the DOT's Research and Special Programs Administration, Office of Emergency Transportation. (Our August 1996 issue recommended a "Synopsis of Seismic Threats in the Western United States - *Impacts to the National Transportation Infrastructure*".)

Seeking to further awareness and action, this monograph is a contribution towards CUSEC's long-term earthquake risk-reduction plan in the Central U.S., which addresses mitigation efforts and response and recovery planning.

The 24-page document provides a history of damaging earthquakes in the Central U.S., addressing the significant areas of growth and other changes since the great earthquakes of 1811-12, and the impacts to the multi-state region that a New Madrid earthquake would impose. A major transportation corridor upon which the economy is reliant, much of the infrastructure sits on vulnerable land susceptible to ground shaking and liquefaction. The monograph is divided into three sections. The first outlines the characteristics of the risk in the area, while the second looks at the effects on the transportation infrastructure. The third represents a vision for the future in the development of a program that addresses the full spectrum of challenges that lie ahead for the region.

For more information regarding this and other useful publications related to this subject matter, please contact the Central U.S. Earthquake Consortium at 2630 E. Holmes Rd., Memphis, TN 38118.

****

~~~~~~

(For general information on these documents and others that may be available for loan from our EQPCE Resource Library, please contact "epiCenter News" Editor, Mr. Richard Cook, @ (415) 977-8326.)

~~~~~~

IS MOUNT RAINIER, WASHINGTON GETTING READY TO BLOW?

By Richard L. Cook
Earthquake Preparedness Center of Expertise

Native Americans of the area used to have a saying: "When Little Sister (Mt. St. Helens) speaks, Big Brother (Mt. Rainier) answers."

All the stir is caused by an article that appeared on the AP wire service titled: "Mount Rainier now tops a University of Washington scientist's list of the most seismically hazardous volcanoes in the Cascade range." There was some very interesting information in this article but it appears that Steve Malone from the University of Washington has been misquoted on numerous occasions by the media.

Activity at Mt. Rainier has not increased or decreased during the past few years. He simply stated that Mt. Rainier is probably more active than Mt. St. Helens. This may be true but clearly not relevant. Mt. Rainier averages three to five magnitude 1.0 earthquakes per month compared to Mt. St. Helens's one to three magnitude 1.0 earthquakes per month. Yellowstone or the Long Valley

(Mammoth Lakes) area have swarms of 100s of events per day. Mt. Rainier's seismicity has been centered in the Rainier seismic zone which is about three to five miles west of the mountain with only a fraction of quakes under the volcano.

Some interesting facts concerning Rainier/Helens that were passed on by Steve Malone are that the City of Orting, which sits in the prime, mud-flow path of Mt. Rainier has sent disaster plans to every household and has been fine-tuning its evacuation plans for the past several years. This statement was made by the Mayor.

Steve stated that "moving Mount Rainier to the top of the list doesn't mean it has become more active; it means that Mount St. Helens has quieted down, relatively speaking, in recent years. Unlike a volcanic eruption, mud flows triggered by an earthquake could come with little or no warning. With millions of people living in Mt. Rainier's shadow, the danger is magnified." He also stated that nearby counties and towns should prepared for disaster and limit building in valleys that are prone to mud slides.

The last major mud slide occurring at Mt. Rainier was about 500 years ago. A 20-foot-tall wall of mud, rock and water sped down the Puyallup River Valley at up to 20mph. The debris flow went all the way to Puget Sound.

There is no recorded eruption of Mt. Rainier 500 years ago which means that it was probably an earthquake that set off the mud flow.

It is also interesting to note that Mt. Rainier holds a volume of snow and ice of about 156 billion cubic feet, which is thirteen times as much as Oregon's Mt. Hood.

Lassen Peak in California now ranks as the second most seismically active volcano.

****

US&R Applications Possible for Innovative and Surprising New Technology

By Patricia A. Kuzmiak
Earthquake Preparedness Center of Expertise

You may think this should be in our own Dick Cook's column, "Believe It or Leave It," as you read on. There are, indeed, some surprising innovations in recent technology that may have promise in the urban search and rescue arena -- once the "bugs" are worked out. Literally. Take, for instance, the continuing endeavors of a bio-robot research team headed by a professor from Tokyo University. Its members have been surgically implanting large, American cockroaches with micro-biotic backpacks, through which insects' paths can be directed via remote control. Dubbed "Robo-roach" by some, recent media accounts quoted the professor as saying that within just a few years we may see the electronically controlled insects being utilized for a variety of special missions. Imagine the possibility of having these roaches crawling through earthquake rubble, "looking" for victims, acting as the eyes and ears for search teams through the images and sounds that are transmitted back via mini-cameras and other sensory devices! The roaches are low-maintenance, being capable of surviving for several months. The Japanese government recently award a five-year, five million dollar grant to the micro-robotics team and biologists at its science center at Tsukuba University in central Japan.

The “Manhunter” is another new system being examined, drawing international interest. This apparatus is a field detector capable of locating individuals through recognition of the electrostatic field that emanates from humans. Among the advantages is the fact that the detector can locate people several hundred feet away from the operator, even through concrete walls. Especially significant to urban search and rescue situations is the ability to locate persons who are unable to signal to rescue teams because they are unconscious or otherwise prevented by their injuries from doing so. Its inventor has likened Manhunter to a “space-age divining rod.” Amazingly, the current system weighs about one pound, using a standard 9-volt battery. A Pennsylvania company began marketing the device in October of last year. For more information, please inquire with Mike Dillabough of the EQPCE (415) 977-8327.

****

THEY’RE EVERYWHERE! PART VII

By Richard L. Cook
Earthquake Preparedness Center of Expertise

Well, once again we’re going to do some traveling around to find just where earthquakes occur. Two states you just don’t think have them are Alabama and Georgia. Well - guess what? They do! The earthquakes listed below will be intensity V or greater which is where the damage really begins.

First, lets take a look at Alabama. My records show they have had 58 shakers between 1811 and 1980 with intensities of V or greater. Once again, this does not cover any that were recorded between 1980 and today. And remember this does not include intensities under V. The following are the quakes that had epicenters within the state boundaries. The others, even though out of state, were felt and damage was done in Alabama.

On February 4 and 13, 1886 there were two earthquakes in Alabama that had an intensity of V and affected over 1,600 square miles. Sumter and Marengo Counties were affected. It was felt on both sides of the Tombigbee River for 32 miles from Moscow. At that place, the earth seemed to move.

There were large quakes with intensities of VII on January 27 and 28 of 1905. These two affected over 250,000 square miles and was centered around Gadsden, Alabama. Chimneys were destroyed and it is said that a well went dry because of the quake. It was felt at Birmingham, as far as Savannah, Georgia, and at Louisville, Kentucky, more than 300 miles away. Aftershocks occurred up to November of that year.

Then in Northeastern Alabama an intensity VII quake struck on October 18, 1916. This one affected over 100,000 square miles. This quake was apparently felt most strongly at Easonville. It was felt from North Carolina to Mississippi and from Georgia to southern Indiana. Near the epicenter, frame buildings were badly shaken, windows were broken, and chimneys were damaged. There were fairly hard shocks at Birmingham and Montgomery.

An intensity V shaker hit Western Alabama and affected the local area on June 29, 1917. The intensity V was around Rosemary, and at Greensboro it was an intensity IV.

Northeastern Alabama had another earthquake on June 16, 1927. This time it had an intensity of V and affected over 2,500 square miles. It was felt in Madison and Jackson Counties. At Gurley and Scottsboro, many people were alarmed and roaring sounds accompanied the shock.

Then on May 5, 1931, Northern Alabama had an intensity VI quake. There were 6,500 square miles affected by this shaker. There was damage done at Cullman and it was generally felt in Birmingham.

On May 4, 1939, Anniston, Alabama had an intensity V earthquake but the affected area is not recorded. Beds moved and many people ran outside. It was also felt at Blue Mountain, Choccolocco, De Armanville, Jacksonville, Jenifer, Lincoln, Oxford Lake, Talladega, and Weaver.

Birmingham, Alabama had their thrill on April 23, 1957 when they were hit by an intensity VI quake that affected about 11,500 square miles. Damage to chimneys, cement, and walls were reported in Birmingham. At Newman, Georgia, many folks were awakened and alarmed. Thunderous earth sounds were heard in several places.

There was an intensity VI earthquake on August 12, 1959 on the Alabama-Tennessee border that affected over 2,800 square miles. There was damage to chimneys and a building was reported damaged at Hazel Green and Meridianville, Alabama. Canned goods were thrown from shelves at New Sharon and people rushed from buildings. At Huntsville, Alabama, wall plaster was cracked.

Then on the Alabama-Georgia border an intensity V shaker struck on February 18, 1964. The area affected is not recorded on this one. It was felt by and awakened nearly all residents at Lyerly and Menlo, Georgia and many were alarmed. Dishes fell from shelves at Menlo. It was also felt in De Kalb County, Alabama.

Four more earthquakes were centered within the state boundaries of Alabama during this time period: December 10, 1974, August 29, 1975, May 4, 1977, and December 11, 1978.

All of these had an intensity of at least V but no further data is available in my record.

And now for you folks in Georgia! You have had 48 earthquakes of intensity V or greater between 1811 and 1980. Even thought there are only eight listed with epicenters within the state boundaries, the others were felt and caused damage in Georgia.

On June 17, 1872, an intensity V quake hit in Milledgeville, Georgia with an unknown affected area. This quake was a sharp shock and brick buildings were jarred.

Northern Georgia was hit by an intensity VI earthquake on November 1, 1875 that affected over 25,000 square miles. This one was felt from Spartanburg and Columbia, South Carolina, to Atlanta and Macon, Georgia, and from Gainsville to Augusta, Georgia. The shock lasted 30 seconds at Washington and Augusta, Georgia, and there were several aftershocks. Rumbling was heard at Washington, D.C.

Then on October 18, 1902 there was an intensity V shaker in the Georgia-Tennessee border region. This quake affected 1,800 square miles. It was felt along the east face of Rocky Face Mountain, west of Dalton, Georgia. There was an intensity of V at LaFayette and was also felt in Chattanooga, Tennessee.

On June 20, 1912 Savannah, Georgia had an intensity V quake with an unknown affected area. This quake was strongly felt.

Near Atlanta, Georgia an intensity VI earthquake hit on March 5, 1914. Over 50,000 square miles were affected by this shaker. The epicenter was 30 miles southeast of Atlanta and was felt in

Cherokee County, North Carolina and several persons in Raleigh. It was also felt in Alabama and Tennessee.

Central Georgia was rocked by an intensity V quake that hit on March 12, 1964. This one affected 400 square miles. This earthquake was felt in Baldwin, Bibb, Jones, and Wilkinson Counties. Almost everyone in Haddock felt it and the residents were frightened.

There were also greater than intensity V earthquakes on August 2, 1974 and December 27, 1976 but the affected areas and exact intensity are not in my record.

Even though the earthquakes in Alabama and Georgia don't seem to be real often, or real big, the important thing to remember is that THERE ARE EARTHQUAKES IN ALABAMA AND GEORGIA! There is no way to tell when the next one will occur or how large it will be, but they are there, and they WILL happen again. Be prepared folks. See you next time. Until then, take care and prepare.

****

Commander,
South Pacific Division — BG J. Richard Capka

Editorial Staff

Managing Editor	Richard L. Cook
Co-Editor	Patricia A. Kuzmiak
Layout & Design	Karen L. Lincoln
Contributing Writers	Gerry Arbios
	Richard L. Cook
	Michael A. Dillabough
	Patricia A. Kuzmiak

California Office of Emergency Services

RESOURCE LIBRARY NOTES

The Earthquake Preparedness Center of Expertise Resource Library has a variety of publications, news articles, slides and video tapes that are available for loan (or copies if available). Catalogs of available titles can be obtained by writing the address listed below.

Although we have a substantial number of resource items, we want more. If you have any publications, news clips, videos or slides that may be of interest to the earthquake response community, please forward them to the address provided below. They will be copied and the originals returned to you if you so desire. Please remember to include the name of the publication and date with any news clipping you provide.

U.S. Army Corps of Engineers
ATTN: CESPN-EQ (Richard Cook)
333 Market St., Room 1024
San Francisco, CA 94105-2195

The epiCenter News contains official and unofficial text and is authorized under the provision of AR 25-30. It is published periodically by the U.S. Army Corps of Engineers, Earthquake Preparedness Center of Expertise, San Francisco, CA. Editorial views are not necessarily those of the U.S. Army. Corps of Engineers or the Department of the Army.