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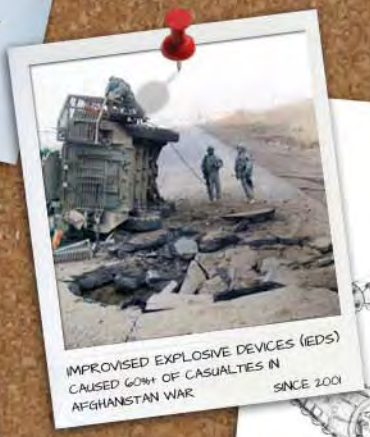
SCIENCE AND TECHNOLOGY IN

RAPID CRISIS RESPONSE



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LETTER FROM THE EDITOR

"Given their forward presence, inherent mobility and flexible capabilities, U.S. naval forces are frequently the 'force of choice' for [Humanitarian and Disaster Relief (HA/DR)] efforts" (Naval Operations Concept Fact Sheet, 2010)

Standing true by this statement, it was evident after the Gulf of Mexico's 2010 oil spill that the U.S. Navy and U.S. Marine Corps have an amazing capacity for providing humanitarian assistance and disaster relief (HA/DR). Due to the location and unprecedented amount of oil spilled, naval technology was well positioned to provide assistance. According to the Department of Defense's Web site, the Navy not only deployed a Naval Air Systems Command MZ-3A airship, skimmers and tow boats to assist in oil detection and removal, but also supplied profiling floats, drifting buoys and thousands of feet of oil containment boom, among other support. Preparing for this issue of the Innovation Newsletter, it became clear that the Navy's warfare technology is frequently applicable to humanitarian efforts.

After the Haitian earthquake, the USS NORMANDY, along with its helicopter detachment, spent 21 days in the Haitian waters delivering food and water to the island's habitants. A little over a year later, the USS RONALD REAGAN arrived in Japan to assist in relief efforts following the earthquake and tsunami. The Navy also served as emergency responders when Hurricane Katrina hit the Gulf shores in 2005, performing search-and-rescue missions while delivering food, water and other supplies to victims. When the Twin Towers were hit on September 11, 2001, the USNS COMFORT supplied shelter, food and medical assistance to the relief workers and volunteers at ground zero.

But the Navy and Marine Corps' involvement is not always making headlines. "Where are the carriers?" is a phrase we hear often during disaster relief efforts. The Military's capability is undoubtedly meant for defending the United States but much of its technologies, especially those developed by the individuals at the Office of Naval Research (ONR), can be applied toward humanitarian efforts. In addition to providing for the National Security of the United States, the Navy and Marine Corps multipurpose platforms are often called upon to provide HA/DR when it is in the Nation's best interest to do so.

Within this issue we have collected a range of articles revolving around science and technology (S&T) in rapid crisis response. Some are from first hand experiences; others are from a technology point of view. We hope you take something out of each and every one of them.

photo credits (left to right): U.S. Coast Guard photo by Petty Officer 2nd Class Gina Rowell; U.S. Navy photo by Chief Communications Specialist Joe Kane, U.S. Navy photo by Culinary Specialist 2nd Class George Disario, U.S. Navy photo by Mass Communication Specialist 3rd Class Kyle Carlstrom, U.S. Navy photo by Photographer's Mate 3nd Class Jay C. Pugh, U.S. Navy photo by Chief Photographer's Mate Eric J. Tilford.

COME HELL or HIGH WATER

NAVAL EXPEDITIONARY MEDICINE LENDS A HELPING HAND

Dr. Timothy Bentley – Deputy, Force Health Protection Pillar, Future Naval Capabilities Program, Code 34, Office of Naval Research

I always find it an interesting twist that the U.S. Navy and U.S. Marine Corps are not always about military power projection and destruction. Certainly, the Navy is the most powerful in the world and serves to defend the United States and its interests. However, the Navy also has a less well known high priority mission which it carries out anytime and anywhere around the world when called upon. This mission is known as stability operations in support of humanitarian assistance and disaster relief.

The Navy has always been interested, involved and supportive of crisis response efforts both within the United States, its outlying territories and in foreign countries. As we have seen from recent events, natural disasters such as hurricanes, tsunamis, tornados and earthquakes can devastate communities, nations and even entire regions. Stability operations are a natural fit for Navy and Marine Corps assets, such as personnel and ships, which are easily distributed and have the capacity to quickly move where needed, even to the most remote regions of the world. Perhaps it is no surprise that this humanitarian oriented work has become a high priority mission and focus for the Fleet.

In support of the stability operations mission, it is a priority for the Office of Naval Research's (ONR) Code 34 as well. As the Warfighter Performance Department, Code 34's science and technology (S&T) efforts naturally fit into support of the Navy stability operations mission. We develop new devices, drugs and procedures for preventing and caring for casualties among Seamen, Marines and other troops.

But what does the Navy's work in warfighter performance have to do with S&T in rapid crisis response? Code 34's new tools and treatments are typically utilized in peacetime, but they also have many features in common with military conflicts. In both cases, the setting is unorganized and hectic, requiring technologies applicable to what we call an "austere environment." Within the Force Health Protection Pillar, Division 342, everything we do to understand the logistics of getting the *right* personnel with the *right* equipment to the *right* location is crucial.

In some battlespaces, there is neither electricity nor roads. Damaged buildings and fallen debris create obstacles for the Warfighter. The environment is disrupted, creating a difficult place to operate which is very similar to most disaster relief scenarios. These austere environments along with logistical issues create a real burden and challenge in developing the proper equipment.

Our devices, whether technical or medical, are meant to be very ruggedized, small and lightweight. Although the soldiers using them are highly trained, we need to ensure the equipment is simple enough for anyone to use. As a result, many of the technologies we help develop are perfect in crisis response situations: new ways to transport blood or medicine using minimal or no fluids; enhanced diagnostic monitors; several efforts in hemorrhage control; and improved resuscitation fluids, to name a few.

ONR helps to develop a broad range of devices now distributed through the naval logistics system and onboard Navy ships making them available for use in disaster relief efforts. Here are a few examples:

Efforts in Producing Dried-Plasma and Platelet Products; Alternative Refrigeration Techniques

Due to lack of refrigeration on the battlefield or in a disaster area, artificial blood technology brings many benefits. Dried-plasma is ideal because it is lighter, very similar to freeze-dried foods. It is portable and non-perishable and can be hydrated by simply adding water.

Refrigeration is another big challenge. If one has perishable medical products, it is possible to get them fairly far forward on the battlefield or crisis location via Navy ships. But when you try and actually distribute them either to the soldier in the ongoing war or to the civilian in the disaster relief situation, refrigeration is not always an option. As a result, Code 34 strives to make things more robust and enduring. One way we do this is to freeze-dry and reformulate the medicine so it is not temperature sensitive.

There are also continuing efforts in producing little boxes, very similar to coolers, but with much more advanced technology. These micro-refrigerators would stay cooler for longer periods of time. Code 34 is also looking at alternative energy sources, such as sunlight or other sorts of fuel cell power, to keep drugs cold.

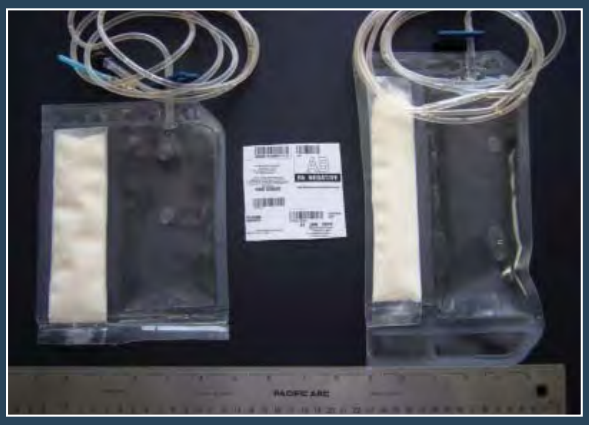
Keeping an Eye on Stats with Wireless Vital Signs Monitor

The Wireless Vital Signs Monitor (WVSM) tracks the status of an individual in regards to their vital signs: heart rate, blood pressure, body temperature and electrocardiogram. Small and portable, the WVSM has the capability to transmit information wirelessly to another medical monitoring device such as a modified cell phone or computer. This would have been very useful during the 2010 mining accident in Copiapó, Chile, had the need arisen. Rescue efforts were constrained by the very small diameter borehole leading to the trapped miners. But due to its small size and lack of cables, the WVSM could have been lowered to the miners and used to monitor their health. Fortunately, the miners were rescued before injuries or illness required medical intervention.

Saving Lives with Hemorrhage Control

Hemorrhaging is a leading cause of death not only on the battlefield but also in disaster areas. Victims may suffer crushing or penetrating injuries due to explosions or fallen debris; fires also cause hemorrhaging due to extreme loss of blood through burned away skin. There are two main ways to stop hemorrhaging and the military leads the way in the development of both: tourniquets and haemostatic bandages.

One device the United States Armed Forces use in hemorrhage control is the tourniquet. Seen widely in history, a tourniquet is a strap tied around a seriously injured limb to pinch blood vessels in an effort to stop bleeding. A long standing myth about the device suggests the patient will lose his or her limb after using



Spray Dried Plasma. 3x concentration 70mL, 86gm (left) vs. 1x concentration 250mL, 267gm (right).

Wireless Vital Signs Monitor (WVSM). FY10: Approved by FDA; NECC purchasing for Resuscitative Surgical Suite (ERSSS).

QuickClot Combat Gauze.

a tourniquet. Proper use of this simple device provides a "bloodless field" during surgery; by keeping the patient's blood inside the body while also providing a clean slate for medical personnel.

In certain areas of the body such as the neck and abdomen, tourniquets are not viable and applying direct pressure is not enough. In such cases, a haemostatic bandage such as QuikClot™ Combat Gauze is useful. These innovative bandages enhance clotting and rapidly stop bleeding by absorbing water from the blood thereby activating platelets and increasing coagulation.

In general, both tourniquets and haemostatic bandages have contributed to the decrease in casualty rates on the battlefield. These types of technologies are very adaptable to use in disaster relief situations.

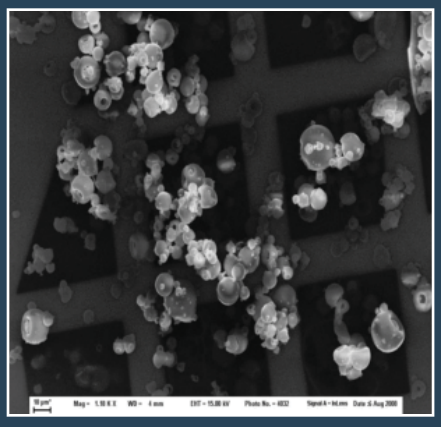
Improved Resuscitation Fluids: The New Frontier

Although it hasn't been fielded yet, Code 34 has put in substantial efforts in developing improved resuscitation fluids. These are extremely useful tools when someone loses a lot of blood through hemorrhaging. Fresh, whole blood is the best resuscitation fluid but it is hard to transport - especially in a disaster area without refrigeration. The resuscitation fluids serve the same purpose as blood but are portable even in bad conditions. The U.S. Army, Navy and Marines have been interested in this idea for years, revolutionizing the way people are cared for on the battlefield.

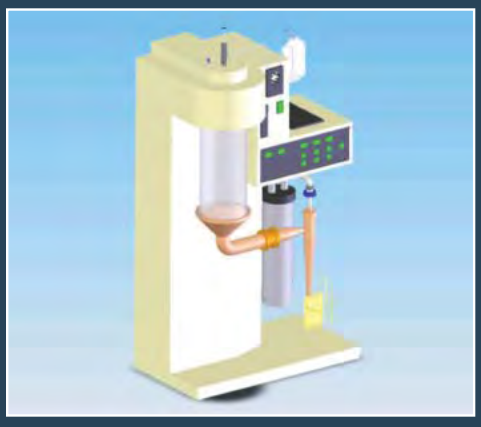
Question for the Future: Mission Specific

New planning efforts will determine the amount of emergency response supplies needed for a particular disaster relief effort. For example, if there are fires, burn injuries will be prevalent. Therefore, plenty of burn related medical gear is required. On the other hand, if there is warfare and shooting activity, trauma care will be necessary. In disasters such as the March 2011 earthquake and tsunami in Japan, a variety of medical equipment is required for the spectrum of injuries encountered. "Mission specific" or "challenge specific" packaging are keywords in determining the best way to pack supplies and distribute them across the world. This is clearly a good question for improving the Navy's capabilities in the future.

When it comes to natural disasters or other crisis situations, many of the medical care devices and treatments originally developed for the battlefield are appropriate for the Navy and Marine Corps' efforts in humanitarianism. The goals of ONR's Expeditionary Medicine program include equipping the first responder and advancing surgical teams and patient transport with sophisticated, life-saving technologies. These innovative capabilities need to be rugged, lightweight and easy to use either on the battlefield or in another type of austere environment. ■



Scanning electron-micrograph image of spray-dried particles.



Drawing of a spray-drying device that uses heated nitrogen gas to dry biologicals in <15 msec without damaging labile proteins.

Prototype resuscitation fluid administration set including dried plasma, platelets and oxygen carrier. Military use will be Universal Donor (AB) Plasma.

S&T IN CRISIS RESPONSE

APPLICATIONS FOR DIRECTED ENERGY WEAPONS

Dr. Tim Andreadis – High Power Microwave Section, Naval Research Laboratory

The Naval Research Enterprise invests in emerging science and technology (S&T) with the hope these programs will eventually transition into the hands of our sailors and marines. During the basic research cycle of the S&T program, the primary goal is mapping programs to current Warfighter needs and potential threats. Limited resources demand that priorities must be established among many needs and specific attention to the countermeasures of our adversaries must be considered. Long-term planning can't always anticipate a crisis but once a crisis occurs we must quickly identify the issue, determine if we already have an existing solution, and if not, develop and then push new technology out as quickly as possible.

Sometimes, a crisis presents an opportunity for a new or overlooked technology and in certain situations, the crisis arises because existing technology has stopped providing acceptable results and a new approach is needed. Directed Energy Weapons (DEW) development has certainly been helped by the urgency for solutions presented by such an event.

Occasionally, a technical solution to a crisis may have been presented some years earlier but resource limitations directed investment towards other technologies with a more immediate application or fleet need (see Rumsfled video at right for more information). A crisis creates urgent needs but also requires urgent solutions. It is imperative that research efforts are appropriately scaled and expectations are kept at realistic levels so the first challenge will be to scope the research to attain a solution within the requested timeline.

The opportunity provided by the crisis has a shelf life; memories are short and with the passage of time, the importance of a solution wanes. To illustrate this point, consider the asymmetric threat provided by inexpensive small boats to large and expensive Naval vessels. A small boat is naturally stealthy to human eyes or to radar, and may even use sea swells for hiding their intent. To enhance its concealment, it can blend in with the local civilian boat population and reveal its intent only as it presses an attack. Additionally, it can carry a variety of weapons with a seamless spectrum of threats.

The power of the small boat attack has been present throughout history. Looking back in history, one can see the effective use of small boats by the Sicilians against the powerful Athenian Navy in ancient Greece. Some modern examples are of the Gulf of Tonkin incident and the attack on the USS VINCENNES, which began just before the accidental shooting of Iran Air Flight 655. In the case of the USS VINCENNES the duel between the ship and small boats lasted for hours and some have identified this issue as a contributing factor to the Iran Air Flight 655 incident. More recently, we have the attack on the the oil terminals in Iraq and the effective use of small boats by rag tag pirates off the Horn of Africa. In the Gulf of Tonkin incident, at the start of the Vietnam conflict, a few small boats engaged a U.S. naval ship and aircraft for hours. Serious damage was sustained by the Navy's ships and aircraft. The aircraft damage came about from the maneuvers executed by Navy aviators to keep them in the fight.

DEW based solutions to small boat attacks were pursued prior to the USS COLE incident.

In 2001, following the attack, there was an added emphasis to increase S&T investments in DEW technology with a clear understanding of the need to propel the research forward. Multiple solutions, both in the radio frequency and high power laser realm have been proposed and explored. Recently, the Office of Naval Research released a video on a

successful demonstration of a counter-small boat, laser based system (see maritime laser demonstration video at right).

The USS COLE incident also introduced another modern day threat: the improvised explosive device (IED), or more accurately, the vehicle/vessel borne IED. DEW solutions were postulated and proposed for IEDs at the time of the USS COLE incident, but weren't considered a top priority. A boost for DEW solutions was only provided after the 2003 war with Iraq focused our attention on IED's when conventional approaches failed to effectively neutralize the threat.

Discovery and invention in S&T isn't usually where scientists and engineers get held up in the innovation process. For many proposed solutions it is the transition and implementation processes of an invention that keeps us from being early innovators. Crucial to implementation is the acceptance by the military and often the civilian population of the proposed technical solution. While crisis isn't a desirable state, it clearly stimulates technology development while providing the necessary realization of the need for the implementation of the technology. Strategically and effectively communicating why a new technology like DEW is important to our national security is crucial in the S&T stage and in the implementation stage. If the application is not acknowledged as a priority and supported by decision makers as an acceptable technology, there will be difficulties in finding support.

The Active Denial System (ADS), a DEW non-lethal system for repelling people using a concentrated millimeter wave beam, has been attractive to the military but many were wary of how acceptable it would be to the general public and other nations (see V-MADS video at right). New military weapons technology is occasionally disruptive and difficult for those unfamiliar with the technology to understand and support. The ADS system is gradually becoming more accepted as the need for long range non-lethal weapons is understood. Currently, cost is increasingly becoming the major holdup as the ADS repelling effect is becoming more acceptable. In general the non-lethal aspects of DEW are drivers for development as hostile forces increasingly use the local population as a shield for military activity and hardware.

Necessity is the mother of invention. This statement is trite but very true. Limited resources will always leave gaps to be exploited by a clever enemy. For the S&T professional, the challenge is to look ahead and predict gaps that new technology may fill successfully. The overall challenge is to be ready when the opportunity presents itself and capable of transitioning the new technology to the warfighter in a timely way in order to make a difference. ■

WATCH

Secretary of Defense Donald Rumsfeld addresses Directed Energy Weapons development
http://bit.ly/aI7udV

ONR presents a maritime laser demonstration of a solid-state high energy laser
http://bit.ly/eEAAVd

Vehicle-Mounted Active Denial System Demonstration
http://bit.ly/3O8hW0

Ushahidi

A COMPANY EVOLUTIONIZING THE WORLD'S RESPONSE TO CRISIS

Interview with Mr. Patrick Meier, Director of Crisis Mapping for Ushahidi

Ms. Allison Donnelly – Analyst, Schafer Corporation in support of Office of Innovation, Office of Naval Research

Imagine a way for people all over the world to tell their story of what was happening to them or around them in a disaster or emergency situation. This concept became a reality when Ushahidi, a non-profit technology company specializing in free and open source software, created the data collection and live mapping platform.

Ushahidi (pronounced "oo-sha-hee-dee"), a Swahili word meaning "testimony" or "witness," builds tools for democratizing information, increasing transparency and lowering the barriers for individuals to share their stories. It is easy to use, accessible to anyone with a cell phone or internet connection and is available worldwide.

Mr. Patrick Meier, the Director of Crisis Mapping for Ushahidi, catalyzes the use of the platform in major crises around the world. "Basically, what these maps allow you to do is have your own helicopter. It gives you a bird's eye view of what is happening," he explained. "With these real-time maps and satellite imagery, you can get that kind of real-time situational awareness, allowing for better decision making."

Ushahidi launched in 2008 during the post-election fallout in Kenya. The developers initially designed the platform to track and chart reports of violence and peace efforts in the country by collecting information directly from the Kenyan citizens. Radio, TV, newspapers and blogs promoted the platform and soon after, thousands of reports came in through the internet and text messaging (SMS).

In the past three years, Ushahidi has expanded throughout Africa and to Europe, South America, the Middle East, Japan and even the United States. Most notably, Ushahidi collaborated with the U.S. Coast Guard and U.S. Marine Corps after the Haitian earthquake in 2010.

But when a country is in a state of chaos, how do the citizens know such a platform exists? To spread the word about Ushahidi in Haiti, Meier and the rest of the staff worked with local radio stations and the community in Port-au-Prince. Soon, CNN and other international news stations featured Ushahidi in their broadcasts, allowing their scope to range even further.

"What we did was set up this free SMS number that anyone could text to within Haiti and tell us their most urgent needs," said Meier, "we started mapping in real time and were getting about 1,000 text messages or so a day."

Haitians provided information on their location, what condition they were in and described anything and everything around them. The crisis reports ranged from status of food and water supplies to search and rescue demands. This information was then placed on a map, providing exact coordinates to relief workers. However, due to the large number of incoming reports, Meier explained how they needed a system to manage all of the collected data. "We were not mapping all of them because we were triaging them first, making the most urgent, life-and-death text messages a priority," he said. "We mapped those first, and then for any of the other needs we had a Skype channel with the U.S. Coast Guard."

This Skype channel served as a medium for other urgent and actionable information received through Ushahidi to the Coast Guard. A few days later, Meier and the rest of the staff found out the Marines were also utilizing the platform to improve their situational awareness.

"The [USMC] was using Ushahidi operationally, tracking the reports in order to send out the helicopters for medical evacuations, search and rescue, that kind of stuff."

"The military completely understood our purpose," Meier continued. "They said, 'this is awesome, let's do this kind of thing.'"

Ushahidi and USMC collaboration did not end after the Haitian relief efforts. When civil unrest erupted in Libya in March 2011, the same USMC individual Meier collaborated with in Haiti asked if the organization had another live map for the African country. Ushahidi presented the real-time crisis map for Libya, thus allowing the Marines to enhance their situational awareness and compliment their previously gathered information.

This preparedness, however, was very unlike the situation in Haiti. "In Haiti, we were really reactive," said Meier. "The earthquake happened, and then we started to do the mapping… We were neither organized nor prepared for it."

Preparedness, education and training in the Ushahidi platform is certainly something the humanitarian community, including the United Nations, is pushing for. If those countries prone to internal conflict or natural disasters have maps previously created, users will be able to post a Tweet, text a photo or update their social media status to Ushahidi instantly.

The Ushahidi group ranges far beyond the free, downloadable software. They also have two other crisis mapping tools, Crowdmap and SwiftRiver, that do not require any product installation.

"The best analogy I have come up with is Ushahidi is to Microsoft Word as Crowdmap is to Google Docs. With Ushahidi, you download and install it, just like any other computer software," explains Meier. "With Crowdmap we are lowering the barrier, you do not have to download anything… It is simply online. Many people who are on the field may not be as tech savvy or interested in downloading a program. It is away to democratize mapping even more.

SwiftRiver, the most recent addition to the Ushahidi group, has a similar concept to Google News but does not limit its coverage to only mainstream headlines. Rather, it brings in information from YouTube, Twitter, Flickr, blogs and even SMS. If there is a crackdown on activists in Zimbabwe, for example, SwiftRiver will collect all of the Tweets, pictures, videos, texts, etc., relating to that event and put them in one place.

"The more witnesses, the more evidence you have makes it more likely that the event actually happened," says Meier. "We are trying to validate crowdsourced information in real time. When you set up your SwiftRiver platform, you put in the keyword and you decide what sources to follow." These sources can range from specific Twitter users or something more generic such as Google.

Al Jeezera Labs tested Ushahidi to map the 2009 events in Gaza. Image credit: http://blog.ushahidi.com/index.php/2009/01/02/al-jazeera-labs-is-testing-ushahidi/

Meier explains, "SwiftRiver will send you articles or tweets from the sources you choose but it is only a sentence or summary of what happened, where it happened and when it happened, that type of thing."

From these testimonies you, the user, can vote on what stories are relevant or not relevant. Is it credible or not credible? Do you choose to follow this source or that source? "As you vote on dozens of these, the algorithm learns," says Meier. Soon, SwiftRiver will ascertain the user's preferences and find other stories with similar material.

With its diverse and multi-functional platforms and programs, Ushahidi attempts to change the world one map at a time. Whether chronicling "Snowmageddon" along the U.S. East Coast or helping save lives after a natural disaster, Ushahidi is an easy technology for crisis rapid response. Meier, born and raised in Africa, also has another important aspect of Ushahidi to share:

"Usually, when you look at the news in Africa, you have corruption, coup d'états, epidemics and so on. Here, you have a different kind of news coming out of Africa. You have a non-profit technology group called Ushahidi coming from Kenya that is developing some of the most innovative software platforms for live mapping," he says. "You have an African group, making software in Africa and exporting it for free to the rest of the world." ■

For more information on Ushahidi, visit their website at www.ushahidi.com

ONR'S TECHSOLUTIONS HELPS DEVELOP ACCESSIBLE CRISIS MANAGEMENT TECHNOLOGIES

Command Master Chief Charles Ziervogel – TechSolutions, Office of Naval Research

Meaning "harbor wave" in Japanese, a tsunami can exact large scale destruction on low lying areas of coastal regions. The aftermath of the March 11, 2011 Japanese tsunami and earthquake was no exception.

Recorded as an 8.9 on the Richter scale, the Great East Japan Earthquake caused the entire country to move several feet west, giving rise to a 50 foot wave that swept inland for miles. Whole villages were washed away, fertile farmland became untenable and thousands of lives were lost. To add insult to injury, the one-two combination punch damaged several nuclear power plants along the coast, releasing radioactive contamination into the surrounding environment. News crews, amateur photographers and monitoring stations attempted to record the ensuing chaos but even the profound images could not capture the catastrophic devastation inflicted upon Japan.

An instant outpouring of support came from around the world, including the U.S. Navy and U.S. Marine Corps. With its planes, ships, and helicopters the U.S. Navy brought not only humanitarian aid and supplies to the civilian population but also technological assistance and crisis management tools to the Japanese government. The Office of Naval Research (ONR), the Navy's Science and Technology experts, was a part of these efforts. Working through its Global offices and a panel of expert Science Advisors from the United States Pacific Command (PACOM) area of operations, ONR provided unmanned aerial and underwater vehicles, radiological decontamination supplies, and nuclear accident planning and response tools. Individual ONR codes were also tapped for the assets and capabilities needed for the short and long term effort to combat and overcome the aftermath left by the disaster.

One of these ONR programs, TechSolutions, responded to a call for assistance and technology from the Seventh Fleet area of responsibility (AOR) and the Japanese Government. TechSolutions, a transformational business process created by the Chief of Naval Research, accepts recommendations and suggestions from Navy and Marine Corps personnel on ways to improve mission effectiveness through the application of technology. Based on this specific request, TechSolutions developed a tool that, if successful, would provide data about the long term effects on the environment caused by the radiological hazards at the Fukushima Daiichi Nuclear Power Plant. Although this project is in its early stages, the team hopes to have

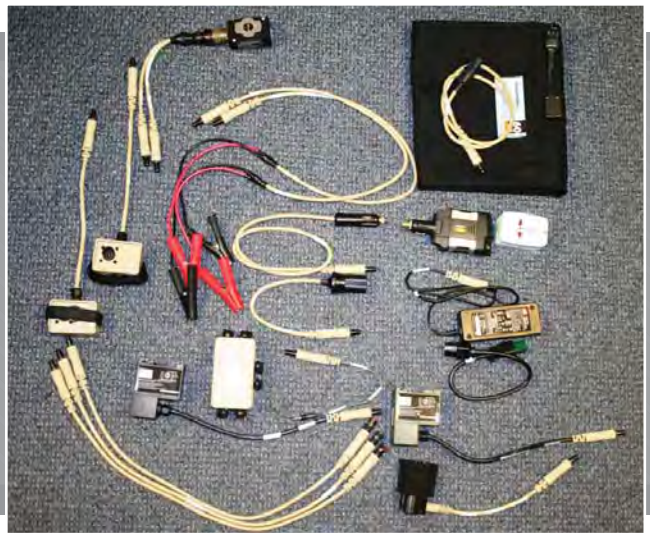
the technology fielded for demonstration and evaluation in late 2011.

TechSolutions is unique. It exists to "speed technology to the Fleet," and operates on Fleet pull, vice a technology push from industry. The program works closely with deck-plate Sailors and Marines to meet specific requirements not readily satisfied with commercial-off-the-shelf technologies and has the flexibility to work within any focus area with the ability to provide rapid, sustainable and affordable solutions. In a constantly shifting battlefield environment, the Warfighter needs technology now more than ever to keep an edge.

For example, in Japan, Sailors and Marines were at the forefront of efforts regarding the search and rescue of survivors and the delivery of supplies to stranded villages. They often found themselves in areas with no electrical power and must carry extra batteries thus increasing their personnel gear load. Warfighters abroad, serving in places such as Afghanistan and Africa, are also burdened by a heavy gear load due to the need to carry specialized batteries.

What if there was a way to lighten the load? TechSolutions responded to a request last year from an Explosive Ordinance Disposal (EOD) technician at EODGRU2 to make Sailors and Marines travel gear load lighter and smaller. Early in 2010, TechSolutions partnered with Protonex and NSWC Crane to develop the Power Management Kit (PMK), centered on a one pound Soldier Power Manager (SPM) and a suite of "smart-tipped" cables. It was designed to allow EOD personnel to operate all of their equipment from either the standard BB2590 radio battery or the DeWalt 18.8v commercial rechargeable battery. By using microcircuits embedded in the tips of multiple extension cables and the SPM, an EOD technician's load out of specialized batteries and chargers is reduced from 50lbs down to less than 10lbs in a soft roll-up kit attachable to a backpack or gear vest using the MOLLE System. This system is currently undergoing testing in the field by EODGRU2 personnel and may soon be in use by Marine EOD technicians and Warfighters all over the world.

While the PMK is just one example of a TechSolutions project, there are many technologies that have been completed or are ongoing with the potential to assist Warfighters as they perform their duties. The Navy is always looking for ways to improve processes and streamline performance; TechSolutions has become an influential and capable force in this effort. Used to broker solutions based on requests from individual Sailors and Marines, TechSolutions works to directly improve Warfighters' quality of life across the spectrum. ■



PMK
POWER MANAGEMENT KIT

By using microcircuits embedded in the tips of multiple extension cables and the SPM, an EOD technician's load out of specialized batteries and chargers is reduced from 50lbs down to less than 10lbs in a soft roll-up kit attachable to a backpack or gear vest using the MOLLE System.

Dr. Cioffi-Revilla discussing the RiftLand project with NGO workers in Lodwar, Kenya.

ADVANCED MODELING CAPABILITY FOR RAPID DISASTER RESPONSE

Dr. Rebecca Goolsby – Code 34, Office of Naval Research and ***Dr. Claudio Cioffi-Revilla*** – George Mason University

What if a severe drought in an African country lasts for five or six years? What could happen to its struggling economy? How would their society be stressed? Will the country's government be able to respond with effective policies? Could there be internally displaced persons migrating toward already crowded city slums? What about the potential for refugee flows into neighboring countries? And is the U.S. Government, along with its allies, prepared to respond rapidly, effectively and efficiently?

Estimating the likely consequences of climate disasters on local populations and governments is hard enough. But what would happen if such a natural disaster occurred concurrently with some man-made incident, such as violent unrest or rising ethnic/tribal tensions resulting from poorly organized elections?

Such occurrences are far from hypothetical but until recently they were considered beyond the limits of rigorous analysis. Now, a new generation of computational simulation models is making it possible for academic researchers and government analysts to begin addressing complex disasters and humanitarian emergencies with new tools to offer hope for improving our national capability in this critical policy area.

With funding from an Office of Naval Research Multidisciplinary University Research Initiative (ONR MURI) grant, a group of researchers at George Mason University is leading an exciting new effort to develop computer simulation models of world regions, such as East Africa, in an attempt to forecast and analyze the human and social impacts of natural and man-made disasters. The group consists of social scientists with anthropology and political science expertise and Africa area specialists, collaborating with computer scientists and artificial intelligence specialists. Dr. Claudio Cioffi-Revilla, professor of computational science and Director of the Mason Center for Social Complexity, leads the team as Principal Investigator for the project.

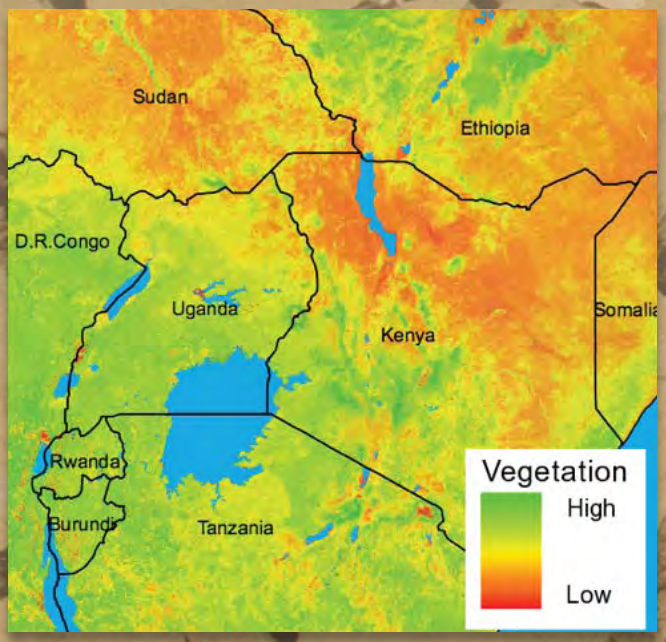
As Cioffi-Revilla is keen on explaining, sub-Saharan Africa was chosen because it is the region of the world where the largest number of people are exposed to a higher incidence of death, disease, or displacement—what he calls "The Three Dreadful D's"—caused by already on-going climate challenges. Plus, East Africa offers an excellent test case for simulation models to integrate the three basic ingredients of spatial complex adaptive systems: natural landscapes consisting of biophysical ecosystems with climate; human and social dynamics consisting

of groups, organizations and governance institutions; and existing infrastructure consisting of engineered systems such as transportation networks, energy systems and emergency facilities. These systems are "coupled," in the sense their interactions cannot be understood in isolation from each other. Until recently, such complex systems were beyond the confines of feasible scientific investigation, so academic researchers and policy analysts lacked the proper tools for understanding the basic dynamics to conduct much-needed policy analyses for use by decision makers.

Now, thanks to key advances in social science theory together with computing hardware and software advances, interdisciplinary teams of computational social scientists, environmental scientists, and computer scientists are now attempting to model and simulate complex dynamics in selected world regions through a new generation of "agent-based" models. The purpose is to learn new insights and conduct "what if" scenario analysis; not to obtain point-like predictions. The hope is that such insights and results from simulated scenarios will one day enable analysts to provide more useful answers concerning cases such as those of Country "X" and related issues. This is an exciting chapter in social science research and science-based policy analysis and planning that uses state-of-the-art modeling and simulation approaches.

Although the models being developed are not a panacea for every policy problem of interest in critical regions, they do offer new information otherwise not available through earlier approaches. For instance, the models are able to uncover combinations of stresses that can bring about state failure, offer suggestions for mitigating the severity of refugee flows, or highlights international or trans-border issues ahead of their occurrence—and hopefully in time to undertake preparatory measures. ■

The George Mason team works closely with cultural anthropologists and ethnographers---the Human Relations Area Files at Yale University---to inform the cultural dynamics represented in the models. In addition, their "scientific diplomacy" includes collaborators in Kenya, Uganda, several European research centers, and the U.S. Department of State's Humanitarian Information Unit.



East Africa Vegetation

Vegetation forms the basis of the model of human/environment interaction in Eastern Africa. Vegetation is dynamically simulated using measured or simulated rainfall each day for each 30 arc second cell in the study area. This drives models of agricultural production and traditional herding.

photo credit: U.S. Navy photo by Mass Communication Specialist 2nd Class Jonathen E. Davis

IN CALM & IN CRISIS

A FIRST TOUR FOREIGN AREA OFFICER'S EXPERIENCES IN FOREIGN HUMANITARIAN ASSISTANCE

LCDR Tom Price – USN, COMPACFLT N5, Foreign Area Officer

Two years ago, as a newly minted Foreign Area Officer (FAO) from the Naval Post Graduate School, I was excited to receive orders to the Commander Pacific Fleet's (COMPACFLT) Plans and Policy Directorate (N5). Upon reporting, however, I was a little deflated as I found out I wouldn't be working as a Country Desk Officer. Instead, I was being assigned to the Functional Plans Division (N55).

My initial fear was I would miss out on the critical FAO experiences a Country Desk position could provide. Fortunately, my fears were misguided. What I didn't know was I would be working with Foreign Humanitarian Assistance (FHA) plans, and at PACFLT, those plans included a "little" project called PACIFIC PARTNERSHIP.

PACIFIC PARTNERSHIP is PACFLT's annual foreign humanitarian assistance activity aimed at cultivating the relationships, skills, and resiliency needed to effectively respond to disasters in the Pacific Command's area of responsibility (PACOM AOR). This annual Humanitarian and Civic Assistance (HCA) mission normally consists of a wide variety of medical, veterinary, engineering, and public health projects, executed from a ship dedicated to the four or five month deployment. This large scale effort brings together the talents and resources of numerous Partner Nations, Non-governmental Organizations (NGOs), the U.S. Interagency, and all branches of the U.S. military. The central theme of the mission, "Prepare in calm to respond in crisis," enables PACIFIC PARTNERSHIP to act as a sort of laboratory for FHA. International participants can come together to deliberately plan and execute many of the activities found in a disaster response, but without many of its pressures. As the mission has evolved, it has also begun to take on the more difficult and deeper commitment of trying to develop the AOR's infrastructure, capacity, and resiliency against disaster.

It was clear to me the joint and combined environment of PACIFIC PARTNERSHIP would provide some tremendous opportunities for sharpening my FAO skills. However, while FAO training at the Naval Postgraduate School and Defense Language Institute prepared me to work in the PACOM AOR, I still needed to learn the basic mechanics of FHA, and how these missions differ from more familiar military operations in order to become a productive member of the team.

Right away my mentors set me to reading numerous background publications on FHA and related operations. In addition, I was sent to courses and workshops such as the United Nations Civil-Military Liaison Officer course, and to FHA table top exercises hosted by PACOM's Multinational Planning Augmentation Team (MPAT). Also, I benefitted from extensive mentoring by PACFLT Plans and Policy Staff, Officers from the First Naval Construction Force, the Pacific Fleet Surgeon's Office, PACOM's Center of Excellence

in Disaster Management and Humanitarian Assistance, USAID, PACOM's Title 10 fund managers, and a host of others.

As a member of the PACIFIC PARTNERSHIP team for almost two years now, I have had great FAO training opportunities and have established networks throughout the PACOM AOR that have proven to be an asset to the mission. One example of this was the planning of combined FHA operations between the U.S. and Indonesian Armed Forces during PACIFIC PARTNERSHIP 2010 (PP10). The center piece of this plan was the combined operation of the U.S. hospital ship, USNS MERCY, and the Indonesian hospital ship, KRI DR SOEHARSO.

Bringing these forces together required close liaison and planning with the Indonesian Armed Forces, the U.S. Office of Defense Cooperation, the U.S. Embassy, and the PACFLT and PP10 Mission Commander Staffs. I was tasked with planning and executing a series of exchange visits and a table top exercise to enable these diverse groups to work together and plan out the details of this unique operation. Following the successful completion of this planning phase, I was selected to deploy with the PP10 Mission Commander's Staff to provide continued liaison support with Host and Partner Nations, and with Non-governmental Organizations (NGOs). Experiences like this provided me with some great insights and understanding of combined FHA response. However, I have learned that even with good preparation the variety, scope, and speed of an actual military response to disaster in the AOR can still be extremely challenging.

When the triple nightmare of an earthquake, tsunami, and nuclear disaster, struck Japan, I was deployed to assist the Joint Support Force (JSF) with Future Operations planning at the U.S. Forces Japan (USFJ) Headquarters in Yokota. The Japan response, Operation TOMODACHI, was unique for a variety of reasons. Not only was the scope of the disaster unprecedented but also assisting a country with Japan's economic power and disaster preparedness required a high level of review. It was vital to ensure that U.S. resources were being properly used and that combined coordination with the Japanese Joint staff was being accomplished. To complicate this review process, the close tactical relationships between the Japanese Self Defense Forces and resident U.S. Forces in Japan created an extremely fast paced operation. The two militaries were able to quickly share identified requirements and take actions to meet them. While this close relationship points to well developed interoperability, one of the top items placed on our agenda was to ensure that this flurry of U.S. military disaster response was being properly vetted, approved and executed.

To accomplish this, we established a Joint Requirements Review Board (JRRB), where every component, staff code, USAID, and the Japanese Joint Staff had a seat at the table. The JRRB would determine if requests for assistance were valid humanitarian requirements, rank them according to their priority, and designate the leads for execution. In addition to collecting and preparing the requirements for each day's review, I would record the results of each board and write the missions into the daily TOMODACH consolidated humanitarian assistance/ consequence management task message. Once we had this and other processes in place, the JSF was able to transition the operation back to USFJ control and redeploy.

Looking back on my experiences, FHA efforts have afforded some of the best possible opportunities for travel and practicing core FAO skill sets. Whether it was as a Civil-Military Liaison Officer for Partner Nations and NGOs onboard the USNS MERCY, or acting as a central collection point for international assistance requests during Operation TOMODACHI, the lessons I have learned in my first FAO tour have prepared me to better support my future commanders with the ability to bring diverse groups of people together, bridge the gaps between them, and ensure mission success. ■

photo credit: U.S. Navy photo by Mass Communication Specialist 1st Matthew M. Bardy

OBSERVATIONS ON THE U.S. GOVERNMENT RESPONSE TO THE "GREAT EAST JAPAN EARTHQUAKE" AND THE NUCLEAR REACTOR ACCIDENT AT FUKUSHIMA DAIICHI

CAPT Jim White – USN, OPNAV N00X

On Friday, March 11, 2011, Japan experienced an earthquake with a magnitude of 8.9 on the Richter scale, the strongest earthquake recorded in Japan and the fifth strongest recorded worldwide. Within the hour, a tsunami followed the earthquake, wiping out several towns and severely damaging many others.

As of this writing, the death toll has reached 14,000 and there are at least as many still missing. Incredibly, the tsunami reached inland as far as six miles and the receding water pulled debris ten miles out to sea. It is likely most of those missing will never be found.

These two events will remain indelibly etched in Japanese consciousness forever. However, as horrible as those two events were, the 14 meter tsunami's wrath on the Fukushima Daiichi reactor site is what captured much of the world's attention. Half of the six reactors shut down automatically by standard procedure. Normal electrical power to the site shut off as well, but emergency diesel generators continued operating to provide power to maintain necessary cooling.

However, when the tsunami struck, it took out the diesel generators causing sources to shift to battery power.

When those batteries depleted about eight hours later, temperatures and pressures within the still hot reactors increased. And while the world hoped things would be brought under control quickly, the outlook changed dramatically when three reactor secondary containment buildings exploded due to hydrogen release from the reactor vessels within.

As Japan is one of the largest overseas stationing of U.S. military personnel outside of Iraq and Afghanistan, there were grave concerns about the safety of the nearly 90,000 active duty personnel, government civilians and dependents living there. In fact, within 160 miles of the Fukushima site are four large U.S. military installations: Yokota Air Base, Yokosuka Naval Station, Naval Air Facility Atsugi and Camp Zama Army Base. With airborne radiation and particulate contamination being measured as far south as Naval Station Yokosuka, 155 miles south of Fukushima, and at the closer bases, uncertainty increased regarding

the conditions of the site far beyond what was featured on CNN. On March 16th, the U.S. government authorized the voluntary departure of dependents of U.S. government personnel. By the time the order was lifted on April 18th, over 8,000 U.S. government dependents had departed Japan.

Twelve days after the earthquake, on Wednesday, March 23, 2011, I received a phone call from the Navy Command Center in the Pentagon. The officer on the other end told me I was to pack a bag and head to Japan as they needed U.S. military people with a background not only in the Japanese language but also in nuclear power. As it turns out, it is a very small gene pool. However, my previous assignment as the U.S. Defense Attaché to the government of Japan (July 2007-July 2010) combined with the 25 years of nuclear power experience I hold as a submariner made me a perfect match.

Four days after the phone call, I was back in my old office at the American Embassy in Japan. I arrived 16 days following the earthquake/tsunami and 15 days following the world's realization things were not going well at the Fukushima Daiichi reactor complex. The events of "3/11" had clearly taken a toll on everyone. The Embassy was in crisis mode while working day and night. An emergency coordination center was in operation synchronizing actions with Washington, D.C., the government of Japan and the U.S. military Joint Task Force (JTF) who arrived previously at U.S. Forces Japan (USFJ) headquarters at Yokota Air Base (about 45 minutes west of downtown Tokyo). The JTF was operating out of USFJ's Bilateral Joint Operations Center. I couldn't help but notice the individuals working in the Embassy had not slept much in the intervening weeks. The stress of the successive natural disasters and the follow-on nuclear accident weighed heavily on everyone's mind; as did the constant refrain of aftershocks.

By the time I left Japan on April 15th, the United States Geological Survey (USGS) had recorded more than 30 aftershocks stronger than the 6.3 magnitude earthquake that had caused widespread damage in Christchurch, New Zealand about one month prior. Many of those aftershocks were greater than 7.0 magnitudes. The concern showed on the faces of nearly everyone. In addition, there were concerns for the majority who had sent their families out of the country as part of the voluntary departure. Not knowing when families could return, or even if they would return, was clearly a major area of distress. While the entire Embassy team was pulling together and working hard to understand the situation at Fukushima and the potential impact on not only on the thousands of American citizens living in Japan but also on the Japanese people, they looked "rode hard and put away wet." It was unclear how they would sustain such level of effort.

Another observation I couldn't help but notice included all of the individuals taking part in relief efforts. It was evident much of the U.S. interagency had sent additional personnel to help Embassy leadership manage the various issues developing every day. The State Department, USAID and the Department of Energy (DOE) fell into this camp. In other cases, there were entirely new groups operating out of the Embassy for the first time. Given the issue at the Fukushima nuclear site it was no surprise the Nuclear Regulatory Commission (NRC) had established a large footprint in the Embassy.

The NRC was appointed as the lead U.S. government agency for the nuclear issue and were very busy working with the Japanese government and the Tokyo Electric Power Company (TEPCO) to understand what was going on with the six reactors at the Fukushima Daiichi site (three reactors had been operating at the time of the earthquake, three others had been shutdown and defueled in the weeks/months prior).

Upon arrival I found myself working for the Ambassador and several U.S. flag officers. While this was not much different from when I served as the Defense Attaché, this time my mission was much more focused. Every day was filled with reactor status meetings, consequence management meetings, ad-hoc meetings, "drive-bys" and end-of-day wrap-up emails specifically related to the nuclear reactor accident. There were meetings with U.S. military personnel at Yokota Air Base (by video teleconferencing and in person), U.S. government personnel at the Embassy and Japanese government, and military personnel at various government offices in Tokyo. Although my 19 days spent in Japan were tiring; they gave me a significant amount of personal and professional satisfaction.

photo credit: U.S. Navy photo by Mass Communication Spec... Ivy M. Bardy

My primary role was to connect people to people and people to problems. The sudden flood of temporary duty (TDY) personnel had challenged the normal communications flow not only within the Embassy but also between the Embassy and USFJ. Many of those sent to Japan did not understand Japan's government, culture, operations within the Embassy, operations at USFJ or the connection between USFJ and the Embassy. As a result, certain tensions existed apart from the overall stress of the situation. In most cases the disruptions to normal communications resulted mainly because folks did not know whom to reach out to.

One area where I was able to add value was assisting senior U.S. officials in navigating the intricacies of meetings with senior Japanese government officials. Knowing who you are speaking with in a foreign government and knowing how to approach a conversation are the types of information gained from experience living and working alongside the people in the country. Fortunately, among the personnel sent to Japan were individuals who, like me, had been assigned previously in Japan and those folks were able to restore critical communications links and provide country-specific context to facilitate successful bilateral interaction.

This brings me to my first observation regarding the conundrum of new people entering a crisis situation severely stresses existing communications links. When providing outside personnel to crisis locations, one must consider its effects, especially when dealing with foreign governments. However, this is not to say operations I witnessed were problematic. They were not. I was extremely impressed by how hard everyone worked together in order to solve problems across a broad spectrum. Nevertheless, it may happen that the arrival of additional support personnel can actually impede existing processes, so disaster plans must be flexible enough to adapt to conditions on the ground and quickly tap into key areas of expertise.

After my first week in Japan it was clear the Embassy could not maintain 24/7 operations indefinitely, bringing me to my second observation. The key part of any crisis situation is the need to establish a long-term, enduring and sustainable posture. In submarine parlance, it is referred to as, "long-term battle stations watch bill." How do you fight your ship over the course of not just a few hours but over the course of many days, weeks or months? It is a difficult people-resource challenge for leadership to work through. Senior leadership at both the Embassy and USFJ recognized the Fukushima Daiichi issue would not be solved in the

new people from U.S. government departments, agencies and organizations who do not normally have personnel assigned and for which there are not funding allocations. Given the current fiscal environment it is uncertain how the proper resources can help manage the long-term issues facing Americans living and working in Japan, particularly the stationed U.S. government consequence management planners and advisors.

By all accounts Operation TOMODACHI, the U.S. government's Humanitarian Assistance and Disaster Relief (HA/DR) response to the "Great East Japan Earthquake," was as remarkable as it was successful. Thousands of American military personnel showed the people of Japan not only the depth of their affection but also their concern for the country. Moreover, they displayed the benefits of forward deployed U.S. forces as they provided critically needed relief supplies and services, cleared Sendai International Airport and rebuilt schools. Although the people and government of Japan will spend years and many trillions of yen rebuilding and rehabilitating their country, the U.S. government, and in particular the U.S. military, will stand shoulder-to-shoulder with them as the work progresses.

It will take a long time to stabilize, contain and clean up the Fukushima Daiichi nuclear reactor site. And while much still needs to be done, I am confident the U.S. government personnel will do all they can to keep U.S. citizens safe, whether they are stationed, vacationing or residing in Japan. The key question is whether or not the "old normal" team will have the bandwidth, resources and backups to carry on indefinitely given the "new normal" in Japan. ■

FROM THE EYES OF THE MARINES
III MEF'S ASSISTANCE IN JAPAN RELIEF EFFORTS

Mr. Ron Gauthier – Science and Technology Advisor,
III Marine Expeditionary Force

An Office of Naval Research Global (ONRG) team of Science Advisors, led by Ken Bruner, U.S. Pacific Command (PACOM), established the Science and Technology (S&T) Cell at PACOM within the first week after the Japan earthquake. The cell's primary purpose was to evaluate technologies for potential insertion into the ongoing relief and consequence management efforts on mainland Japan in the wake of the 8.9 magnitude earthquake and resulting nuclear accident at the Fukushima Daiichi nuclear power plant.

Frank Bantell from Commander United States Pacific Fleet (COMPACFLT) and Donn Murakami from Marine Corps Forces Pacific (MARFORPAC) were the two other key Science Advisors based on Oahu who assisted Bruner in running the 24/7 S&T Cell to support Operation TOMODACHI, providing subject matter expertise in nuclear reactor risk assessment.

The team evaluated around 30 technologies and inserted the select few into relief efforts. Several technologies provided unmanned aerial and ground reconnaissance to monitor radioactivity released into the environment (atmospheric and ground contamination) from the damaged reactors at Fukushima Daiichi. Other unmanned aerial systems (UAS) examined for potential use had the capability to carry inert loads of smothering materials to be dropped on the reactor to suffocate the reactions and releases (as done in final stages of Chernobyl) if the crisis reached a critical stage and only if the government of Japan requested this support.

Other unmanned ground vehicles (UGVs) were assessed for their capability to penetrate the internal spaces of the reactor buildings and provide "eyes-on" views not capable from human inspectors due to the significant radiation risk. Donn Murakami worked to facilitate insertion of an ONR-funded decontamination gel, used on vehicles in Atsugi, Japan. Although this decon gel was able to remove contamination better than the standard methods, it was not able to decrease the levels to those prescribed by the stringent regulatory limit of 100 counts per minute.

Travis McCune from Commander, U.S. 7th Fleet (C7F) and Ron Gauthier from III Marine Expeditionary Force (III MEF) also supported the S&T Cell by looking at specific requirements of the Navy and Marine Corps forces, respectively, carrying out relief and consequence management efforts from the sea, air and ground. Since many of the Naval ships received radiological contamination from both atmospheric deposition and intake of seawater,

McCune worked on site from the USS BLUE RIDGE and at the U.S. Forces Japan Headquarters in Yokota, Japan to develop a better understanding of the radiological dispersion through the use of air and sea monitoring and modeling methods.

Because III MEF headed up the Humanitarian Assistance and Disaster Relief (HA/DR) efforts on the ground and had the lead in planning voluntary departures and mandatory evacuations if necessary, Gauthier supported the staff in Okinawa in understanding the perplexing radiological issues as a result of the many different agencies, military units, monitoring methods, dispersion models and units of measurement in operation during the crisis response.

In summary, the ONRG team of Science Advisors worked diligently as a team to provide evaluation and insertion of innovative technologies in support of military operations during this international crisis, and provided unique subject matter expertise in nuclear incident risk assessment, radiological monitoring, and physical modeling. ■

Ronald Gauthier is the III MEF Science and Technology Officer in Okinawa, Japan. He helped lead the human assistance and disaster relief (HA-DR) efforts on ground and also planned for evacuation needs after the Japan earthquake. Both efforts had a focus in the chemical, biological, radiological and nuclear agents (CBRNE), as did much of all the operational support due to the nuclear accident.

photo credits (clockwise from top): U.S. Navy photo by Mass Communication Specialist 3rd Class Anthony Johnson, U.S. Navy photo by Mass Communication Specialist 2nd Class John Smolinski, U.S. Navy photo by Mass Communication Specialist 3rd Class Kevin B. Gray, U.S. Navy photo by Mass Communication Specialist 2nd Class Devon Dow, U.S. Navy photo by Chief Mass Communication Specialist Jonathan Kulp, U.S. Navy photo by Mass Communication Specialist 2nd Class Joseph M. Buliavac, U.S. Navy photo by Mr. John F. Williams.

CHILEAN ADMIRAL SHARES COUNTRY'S EARTHQUAKE RECOVERY EFFORTS

Mr. Geoff S. Fein – Corporate Strategic Communications, Office of Naval Research

Salvage teams used diverse engineering techniques to successfully raise sunken ships and free grounded vessels in Chile, after last year's earthquake and subsequent tsunami, a Chilean admiral told the audience gathered at the Office of Naval Research (ONR) for a May 31 lecture.

Director of Programs, Research and Development for the Chilean navy, Rear Adm. Giancarlo Stagno Canziani led the naval recovery operation in the port of Talcahuano after the February 2010 8.8-magnitude earthquake. Stagno, who culturally uses his paternal surname, was an invited speaker in ONR's ongoing Distinguished Lecture Series.

With damage to several navy vessels and a vital shipyard, Stagno said his experts were faced with a daunting task.

"We had no idea how we would do the job," he said.

Talcahuano is home to a naval base as well as ASMAR Shipbuilding and Ship Repair's main shipyard. More than 250 personnel, including crews from the grounded vessels, participated in the work.

The tsunami waves had either grounded or sunk the missile ship Chipana (LM-31), decommissioned destroyer Almirante Cochrane (DLH-12), General Service Barge Pisagua (BSG-116) and ferry BRT Sobene. Additionally, three floating docks were pushed up onto piers, and one of those structures, the Young, contained a submarine.

To move the Young without damaging the ship took an engineering feat, Stagno said. The structure, which was precariously perched on land, could not be lifted, so the crew cut some of the pier and placed metal plates beneath it. Roller bags were eventually added to enable the Young to slide into the water. The entire effort took four months and was successfully completed on July 14, 2010, Stagno said.

Since the earthquake, the Chilean navy has decided to move its logistics facilities, munitions depot and housing to higher ground, Stagno said.

Dr. Larry Schuette, ONR's Director of Innovation and sponsor of the lecture series, said he admired the Chilean navy's innovation. "Recall last year's mine explosion experience? The Chilean navy actually built the capsule that brought the 33 trapped miners up," he said.

Now in its third year, ONR's Distinguished Lecture Series stimulate leading-edge discussion and collaboration among scientists and engineers representing Navy research, the Department of Defense, industry and academia. Previous lectures focused on innovation in India, the critical need for basic scientific research and new approaches to coordinating scientific collaboration among federal agencies. ■

Rear Adm. Giancarlo Stagno Canziani shares his Naval experiences after the Chilean earthquake of 2010.

DIRECTOR'S CORNER

THE CRISIS IMPERATIVE

Dr. Larry Schuette – Director of Innovation, Office of Naval Research

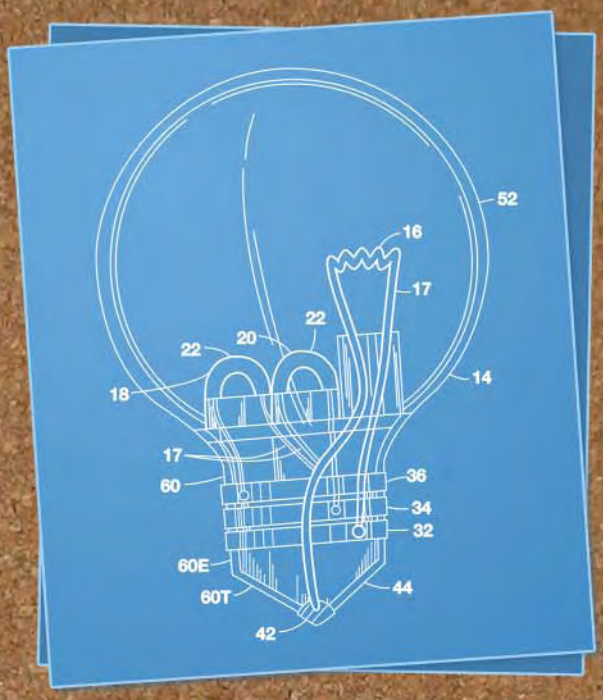
We've all been told that in a crisis, time seems to slow down. Last year I was lucky enough to perform the Heimlich maneuver on a choking victim and time certainly seemed to slow down to me. Everything around me went into slow motion and uncharacteristically, I didn't feel rushed or excited. Adrenaline is nature's triple shot of espresso and is released by your body as a reaction to stress. In my case, the adrenaline surge lasted for several hours after the event as I relived it over and over (and yes the lady I assisted was doing fine when I last saw her).

National emergencies can have the same effect on science and technology (S&T). What normally takes years to transition to the Warfighter can suddenly see front line service in a matter of days, weeks or months. This is not a new phenomenon: history is replete with stories of just in time innovations (one of my favorites is the USS MONITOR). The question then is how to keep the adrenaline going? What causes innovation and the transition of S&T to slow down once the crisis passes? Are there ways to harness the power of process that will enable S&T to make it to the warfighter? These questions are at the heart of organizations like the Joint Improvised Explosive Device Defeat Organization (JIEDDO) or the Rapid Equipping Force. Frustrated with the delays of getting S&T into the field to defeat IEDS, these organizations take S&T and quickly field it. When trying to defeat IEDs the risk calculus of bringing immature or unproven technology to the field is outweighed by the lives saved.

At ONR we are also concerned about the processes that can slow down S&T reaching the warfighter. We recognize the acquisition risk trade space isn't as simple as some believe but also recognize there is opportunity in allowing the warfighter to experiment and evaluate technology while it goes through the development process. Recently the Chief of Naval Operations (CNO) instituted the Fleet Experimentation (FLEX) Program at Fleet Forces Command. This program allows operators and scientists to evaluate technology in realistic environments. Additionally the CNO asked the Chief of Naval Research and the Director, Naval Warfare Assessment (NOOX) to look at what technologies could be amenable to "Speed to Fleet" acceleration. I'm very excited about the "Speed to Fleet" concept. Here funding would be applied to mature technologies and then placed in the hands of warfighters for extended evaluation while the normal acquisition process proceeds.

One thing that has changed over time is the ability to quickly make the parts needed for innovations. Technologies like numerically controlled equipment, simulation based design, and direct digital manufacturing enable innovators to quickly go from idea to working prototype. While John Ericson leveraged multiple local foundries to quickly produce the parts needed to make the USS MONITOR (less than 120 days), today we find manufacturers using the internet to rapidly farm designs out for simultaneous production. The power of computer aided design, logistics and manufacturing is remarkable and has dramatically increased the ability to rapidly get S&T to the warfighter.

Certainly, we are living in interesting times. ■



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