

Operation TOMODACHI: A Model for American Disaster Response Efforts and the Collective use of Military Forces Abroad

Rockie K. Wilson*

John F. Kennedy School of Government, Harvard University, USA

Abstract

On March 11, 2011 the largest earthquake in Japanese history, measuring 9.0 on the Richter scale, occurred off the coast of Sanriku in the Tohoku region of Japan. The quake triggered a massive tsunami which just moments later overwhelmed settlements and caused catastrophic damage to coastal prefectures. The destruction of homes, businesses, public services, and basic infrastructure combined with the consequences of tsunami damage to the Fukushima Daiichi Nuclear Power Station reactors served as a “game changer” for Japanese crisis response and most specifically the relationship it maintains with its now most strategically -- The United States.

At 3:30 PM, just 44 minutes after the earthquake hit, the Japanese Ministry of Defense established an Emergency Headquarters in order to initiate response operations. At 7:30 PM, the Defense Minister made history when he mobilized 8,400 Japanese Self Defense Force personnel to augment the overwhelmed Japan civil response capability. Just a few short days later, on March 14, Japan took unprecedented action when it established a joint task force to oversee all response operations.

Almost immediately after the earthquake, United States Forces Japan in conjunction with the United States Pacific Command initiated a 3-Phase Operation “TOMODACHI” to support the Japanese Self Defense Force response and the people of Japan. These operations included involvement from ground, air, and maritime forces working collectively with their Japanese counterparts to provide immediate relief efforts where no others could. This paper analyzes the collective actions and significant coordination efforts between US and Japanese forces throughout the TOMODACHI response. This is done by identifying successes, challenges, and general lessons learned for future disaster response application and collaboration.

Keywords: Operations; Tsunami; Military forces; Defense

Introduction

On March 11, 2011 at 2:46 PM three giant earthquakes occurred along the edges of tectonic plates approximately 250 miles northeast of the Tohoku or Northeast region of Japan’s mainland, otherwise known as Honshu Island. At first thought to be a single giant earthquake, the series of tremors occurred in succession a mere 6 minutes from start to finish; registering at an unprecedented 9.0 on the Richter scale within the region. The quake resulted in a horizontal sheer displacement of nearly 20 meters on the Pacific floor. So significant was the quake, it was felt across multiple regions ranging from all the way from Chile to Alaska. The resulting tremors unleashed a total of seven waves over a course of 6 hours; the greatest of which hammered the coast with waves as tall as 14-20 meters and reaching as far as 6 miles inland. The catastrophic effects of the 1000-year event far exceeded all design and planning standards -- causing destruction to homes, businesses, public services, medical care facilities and infrastructure of all types. The loss of property and services paled in significance to the 28,000 dead or missing across Japan [1]. After early assessments, it was clear that even the complete mobilization of all civil and military forces would be insufficient to support acute and long-term recovery operations. Only with the support of its allies could Japan overcome its greatest obstacle since World War II and bring stability and a renewed sense of hope to its people [2].

Having a very limited supply of natural energy resources, Japan relies on Nuclear Energy for approximately 30% of its total domestic power supply. More specifically, nuclear energy accounts for the majority of electricity consumed by Tokyo and surrounding areas [3] On March 11, just 26 minutes after the first earthquake, the tsunami that hit mainland Japan caused significant damage to the Nuclear Power Plant in Fukushima Daiichi (approximately 170 miles North

of Tokyo). The plant consisted of six nuclear reactors and a series of spent-fuel pools containing a highly radioactive byproduct of the decay heat nuclear power process. While, the reactors themselves were protected in two-meter thick concrete structure housing vessels, the spent-fuel pools, were much less protected within an unhardened facility construct. Both the active and inactive fuels required constant circulation of water to prevent overheating and destabilization. The facility design standards required that both the primary and backup power supplies (needed to ensure water circulation), were 10-13 meters above ground level. The damage sustained as a result of the tsunami quickly overwhelmed electrical production and distribution systems which in turn raised water temperatures and exposed the radioactive material to the air. The process heat combined with the mixed properties of zirconium, oxygen and hydrogen caused reactors 1 and 3 to explode early the morning of March 12, 2011. The melee of activity over the following 10 days by both Japanese civil and military forces and the international community served as a “game changer” leading to an unprecedented Japanese crisis response and enhanced relations with its most strategically -- the United States (US).

*Corresponding author: John F. Kennedy School of Government, Harvard University, USA, E-mail: rockie_wilson@hks12.harvard.edu

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Integration of Capabilities

At 3:30 PM on March 11, just 44 minutes after the earthquake hit, the Ministry of Defense (MoD) established an emergency headquarters to initiate response operations. At 7:30 PM, the Defense Minister made history when he mobilized 8,400 Japanese Self Defense Force personnel to augment the overwhelmed Japan civil response forces. A few days later, on March 14, Japan made history when it established Joint Task Force to oversee all response operations under the Command of the General of the Ground Self-Defense Force's Northeastern Army -- increasing the total number of personnel activated to support the response to 107,000. The new Joint Task force aligned all Ground, Marine and Air Forces under the single Commander. These forces would focus on the earthquake response operations while a parallel Central Readiness Force Commander would focus on the mitigation of the ongoing nuclear crisis [4]. Nearly 500 additional personnel were dispatched from the Self-Defense Force's Central Nuclear, Biological, and Chemical Weapons Defense Units, under the Central Readiness Force Command, to address the now growing concern of the Fukushima reactors. These operations marked the largest mobilization of personnel and equipment in Japan's history.

Shortly after the first impacts of the tsunami were felt, the Government of Japan (GoJ) realized, even after the large mobilization of forces, that it would need support from its allies to address growing humanitarian needs. The US Agency for International Development (USAID) is the US Government's lead federal agency for international Humanitarian Assistance and Disaster Response. Based on early collaboration with the US Embassy in Tokyo, USAID deployed a Disaster Assistance Response Team to establish a Bilateral Assistance Coordination Cell to implement a sustainable coordination process within which the US and GoJ could develop consequence management activities to transition from the critical phase of the recovery to a longer-term stabilization process. This coordination cell was comprised of the USAID Disaster Assistance Response Team, Department of State (DoS) representatives from the US Embassy, and eventually technical representatives from the US Department of Energy and Nuclear Regulatory Commission. The team quickly interfaced with GoJ representatives from Prime Minister Goshi Hosono's Crisis Management Team to receive, vet, and respond to requests for assistance and conversely to present their own offers of support operations. After receiving a request, the coordination cell worked to match the unique need through a resource mapping process in order to determine if the capability was available within country and to confirm that the US possessed the comparative advantage to provide support and avoid duplication. For example, the US Bilateral Assistance Coordination Cell and GoJ Crisis Management Teams developed processes to provide aerial radiation monitoring flights from Yokota Air Base. These groups negotiated initial monitoring efforts and the long-term transition of the mission, along with all other components of air, ground and sea radiation monitoring operations, back to the GoJ. Rather than inappropriately thrusting capabilities and services upon GoJ, the coordination cell developed a controlled and methodical process for determining and coordinating aid. This process went against the grain, in many regards, where forces at times attempted to negotiate support operations, based on in-theater capabilities, at lower echelons [5].

Almost immediately after the earthquake, US Forces Japan in conjunction with the US Pacific Command initiated a 3-Phase Operation "TOMODACHI" in order to execute support arrangements negotiated between the Bilateral Assistance Coordination Cell and the Hosono Crisis Management Team.

- **Phase 1:** Emergency Response – Immediate Lifesaving and Search and Recovery
- **Phase 2:** Relief – Mitigate Suffering and Meet Basic Needs
- **Phase 3:** Restoration – Restore to Pre-Earthquake Conditions [6]

Specifically, US Forces Japan worked to align capabilities to complement the ongoing response. Despite several challenges, US Pacific Command, with jurisdiction and command authority over all Department of Defense (DoD) forces in the Pacific, worked conjunctively with its subordinate agency US Forces Japan to build a separate command structure dedicated to TOMODACHI operations. As a result, US Pacific Command expediently stood up its own separate Joint Task Forces from March 13-17 to address the growing requirements that US Forces Japan could no longer organically support [7]. Joint Task Force (JTF) 519 was tasked to safeguard the welfare of US citizens located in Japan and support the ongoing Humanitarian Assistance Disaster Response operations with Self-Defense Force counterparts.

Subsequently, JTF-505 was tasked to evacuate those US citizens wishing to depart Japan in the wake of the crisis. While JTF- 519 would maintain direct or tactical control of all US ground, air, and maritime forces, JTF-505 would be directly supported by both JTF-519 and the separate functional Joint Forces Air Component Commander in charge of air operations. While JTF-519 was accountable for all HADR operations, the Air Component Commander was tasked to provide direct support with air assets as needed. It was through this organizational structure that Bilateral Assistance Coordination Cell would provide all agreed upon support requirements and with which the Japan Self-Defense Force JTF would coordinate the operational and tactical elements of support.

Prioritizing US Response Operations

The use of military forces to support humanitarian operations has grown to be almost commonplace in today's world. The capability and unrivaled response the US military has brought to recent crisis has changed not only the way the military is used but the way that people and governments think of the military. This overwhelming capability can be seen during Japan's most critical time of need. In evaluating the multiple aspects of the US military's response during the Great East Earthquake of Japan, this paper segregates response operations into two subsets: 1) US National Security Interests and the Safety and well-being of US, 2) Support of Humanitarian Assistance and Disaster Response Operations.

US national security interests and the safety and well-being of US citizens

In line with traditional national security priorities, it is assumed that the US Government considered the welfare of US citizens as the top priority when organizing response operations. This section details DoD's role in protecting US interests in Japan during TOMODACHI. These examples will be used later in this document to identify both success stories and areas where further analysis or corrective measures are needed.

On March 17, with growing concerns of airborne radiation particulates from the reactor breach, the DoS authorized the voluntary evacuation of all DoS dependent family members within a 200-mile radius of the Fukushima Plant. The Commander of US Forces Japan, in coordination with the lead JTF-505, quickly followed suit by authorizing voluntary evacuations for all DoD dependents as well. The

operation, coined "PACIFIC PASSAGE," posed numerous challenges for military leaders and families alike. First, limited information was still known about the nature of radiation and its potential to spread throughout the region at the time of implementation of PACIFIC PASSAGE. Based on all known plume modeling predictions (used to anticipate airborne radiation migration based on wind conditions and weather), much of the radiation would likely spread away from mainland Japan and back towards the Pacific Ocean. The majority of military installations resided well outside of the 25 nautical mile radius where primary health risks were identified to be most prevalent by US Pacific Command Operational Exposure Guidance [8]. In addition, several measures were implemented on US installations to protect the well-being of residents including the pre-placement of dosimeters (radiation detection devices), Potassium Iodide (KI) tablets (used to protect against absorption of radioactive iodide into the thyroid gland), and personal protective suits and equipment on the unlikely chance that contamination would occur. Despite these efforts and the remoteness of exposure, DoS and DoD erred on the side of caution.

In addition to the radiation danger itself, US policymakers also had to contend with potential for hysteresis among US citizens as they were alerted of the radiation contamination risk that existed only 125 nautical miles away. The liability and external perception of not authorizing a voluntary departure at the expense of the US government would have become a very emotional and a likely very political situation for both DoS and DoD officials. With the small amount of information available regarding susceptibility of the food and water supply to cross-contamination, the risk of both real and imagined dangers were significant threats to US installations across Japan. The contamination of the water supply was later found to be very real as radioactive iodine was found in the Tokyo water supply on two separate occasions from March 20-23. Based on all these factors, the voluntary evacuation of US citizens from Japan now appears wholly appropriate.

Many DoS families lived miles closer to the contamination posed by the Fukushima plant (albeit still well outside the 20-mile primary standoff) than did the counterpart DoD families. Once DoS authorized the return of their dependents, DoD had little choice but to follow suit given the potential appearance of disproportionate policies. The voluntary evacuation policy further allowed the US Government to assist US citizens without giving the perception of abandoning Japan. In the end, PACIFIC PASSAGE used primarily government contract airline carriers to evacuate over 9,000 people (out of a potential 85,000), 500 pets and 4,200 short-tons of cargo. It was essential to leverage the contract carriers early on; had the radiation plume come closer and closer to US installations, requiring a complete evacuation, it became less and less likely that carriers would have operated in known contaminated environments. Making the decision to voluntarily evacuate personnel with commercial airlines early in the process eased the burden of potentially having to evacuate all personnel with military airlift later on [6].

As a result of deliberations between the US and Japan and the creation of a bilateral radiation monitoring group, JTF-519 as the lead for all US military capabilities, coordinated with the Department of Energy (DoE) to conduct the radiological mapping operations needed to determine the location and concentration of radiation contamination [4]. This process confirmed exact locations and movement patterns of the radiation rather than relying exclusively on computer-aided models. The 459th Airlift Squadron, out of Yokota Air Base, working with DoE officials confirmed radiation levels through mapping operations. The Squadron provided two air platforms from which DoE

personnel could calibrate equipment and measure radiation levels. On March 17, the UH-1 "Huey" Helicopter platform flew the first mapping mission out of Yokota. Based on US government directives (which were rumored to have come from as high up as the President himself), the mission priorities were to first observe locations with American citizens, such as the Tokyo embassy and local military installations, for signs of contamination. The UH-1 was ideal for this mission set based on its ability to fly as low as 500 feet above ground level and at relatively slow speeds. The result of these first missions indicated very little risk to US personnel who were still a significant distance from the main concentration of radiation. Although dosimeter readings on the ground indicated the same earlier in the week, it was comforting to validate the absence of airborne particulates as well.

In addition to its rotary wing counterpart, the fixed-wing C-12 "Huron," was also used extensively for mapping operations. The C-12 was the first airframe to execute missions over the Fukushima plant and was the first to baseline airborne contamination levels. Whereas the UH-1 was used for more isolated areas, the C-12 could fly at much higher speeds while at an atypically-low profiles of 1,000-2,000 feet above ground level. These unique missions, jokingly called "lawn mowing" and "crop dusting" by the respective aircrews, were eventually optimized to meet the very specific airspeed and altitude requirements of the DoE infrared thermography equipment obtaining readings. The value of the readings improved over time as a closer synergy was ultimately developed between the Airmen flying the aircraft and to the scientists taking the measurements. This innovative new mission, although ultimately transferred to the Japanese Self-Defense Force, provided an essential component to recovery operations that would not have happened in such a short timeframe without US military involvement. The importance of the mapping data was best described by the 459th Airlift Squadron Commander himself, Lieutenant Colonel Eugene "Gene" Capone after the completion of US mapping efforts:

"But the interesting plots we started to get were the ones that were up around the plant, and you could actually see the lay-down of the radiation on the ground as a result of where the winds were blowing from...I think it was critical info for the GoJ to help them gauge how far the evacuation area needed to be, where the danger areas were."

While the aircrews became more efficient at both flying and training their peers to fly the unique mapping missions, these assignments brought significant risk to both themselves and their aircraft. During one C-12 mission, while flying along the eastern seaboard, DoE scientists identified higher-than-normal radiation levels on the aircraft. After flying for a bit to see if the levels would subside, the DoE experts concluded that their aircraft had flown through an eddy of radiation matter. Fearing for their safety and the long-term functionality of the aircraft, the aircrew reported the incident back to Yokota. Although the procedures for the handling of contaminated aircraft had been formally codified, it was far from something the Air Force practiced regularly and was not well understood by practitioners in the field or at the tactical level. The feasibility of this type of event had been discussed extensively before the missions started, but given the necessity of the mapping operations, the risk was acknowledged as a necessity. Upon returning back to Yokota, the radiation was deemed to be low enough in quantity to not pose a significant health risk. Further, a simple soap bath eliminated the contamination on the external frame of the aircraft. Despite what was ultimately a benign incident, the incident exemplified the risks taken aircrews every day. The occurrence also signified the unpredictable nature of the winds and that the plume modeling, although effective, was far from completely reliable. At the time the

aircraft flew through the contamination, the team was flying well upwind and outside of any modeled radiation. The incident reinforced the value of having real world data and the value of the mapping operations. To add further context, a later decision to evacuate a US Naval Port in Yokosuka, Japan was made thanks in large part to data generated on prevailing wind directions during mapping surveys [9].

As part of Operation TOMODACHI efforts to safeguard US citizens, US military leaders placed prepared both military members and their dependents remaining in the country for the worst possible scenario. The development of a Pacific Command-specific contamination threshold matrix identified specific risks to personnel, equipment, vehicles, and aircraft and developed procedures for new shelter-in-place, evacuation, and decontamination processes. These developments marked significant safety improvements in the field of radiological contamination for the US military and built a methodical set of thresholds to inform and direct US forces and families. For example, at Misawa Air Base, wastewater collection points were created to store known contaminated water in fuel bladders; this process resulted in the safe collection of 7,000 gallons of contaminated rinse water from aircraft washing operations [10]. Efforts were also made to standardize decontamination procedures for returning aircrews and ground crews in the instance that they were ever contaminated. The US also organized available chemical decontamination experts into what were coined Joint Radiological Monitoring "Decon Teams." These teams included personnel from the Air Force Radiation Assessment and Aerospace Medicine Teams, Army Chemical Corps, Navy Radiological Control teams, and the Japanese Air Ministry Laboratory. This concept provided a proven radiological and consequence management capability throughout the region [11].

Defense deployed 80 personnel from the Japanese Internal Bureau across these Bilateral Coordination Centers to help simplify the processes. The Japanese Tohoku Defense Bureau also dispatched language officials to each of the centers to help with translation and to streamline discussions and to help clarify capabilities and roles and responsibilities between the two nations [12].

The US Forces coordinated support operations through a "hub and spoke" concept leveraging existing permanent installations in outlying areas of Japan and Okinawa as staging points to cycle supplies to bases closer in proximity to relief operations. US installations including Iwakuni Marine Corps Air Station and Sasebo Naval Base, on mainland Japan, and Kadena Air Base and Marine Corps Air Station Futenma, on Okinawa, were used as logistics nodes to provide airlift, sealift, and ground transport to Yokota Air Base, Misawa Air Base, and Naval Air Facility Atsugi. In turn, these installations would make the final push of supplies into initially Yamagata and eventually Sendai upon its opening. Sasebo was also used as a primary hub for resupply of the Essex Amphibious Readiness Group and the USS Ronald Reagan Carrier Strike Group. The USS Reagan, which was originally scheduled to participate in an exercise on Sendai Bay on March 13, 2011, was ideally placed to provide search and recovery operations using PC-3 patrol aircraft and helicopter airframes. The mere presence of the Reagan in the bay was said to have brought a sense of hope to the Japanese people [4].

The US had the logistics structure needed to transport additional Japanese Self-Defense Force personnel from around the country to support frontline operations. While US carrier-based aircraft landed on Self-Defense Force ships to pick up and transport supplies inland, US ships also transported critically-needed supplies. For example, the US Landing Ship Tortuga transported 300 Self-Defense Force

personnel and 100 Japanese vehicles from Hokkaido (Japan's second largest Northern Island) within close proximity to relief operations. Likewise, US C-17 aircraft transported hundreds more from Okinawa to mainland Japan. Over 28 days, more than 24,000 US military personnel, 24 ships and 89 aircraft augmented Japan's humanitarian assistance and disaster relief efforts [13].

Immediately following the Great East Earthquake of Japan, both Narita International and Haneda Airports were closed for several days as a result of their close proximity to the Eastern Seaboard. Although not directly impacted by radiation fallout, both airports were devastated by the earthquakes and resulting tsunamis. Passengers sitting on the tarmac reported what felt like turbulence despite having not left the ground. The Sendai Airport, which would have been the optimal relief outlet for aircraft en route to both Narita and Haneda, was overcome by waves as well. In total, six separate airports were all forced to close on at least a temporary basis immediately following the incident. Ultimately, nearly all international flights into the Tokyo region were cancelled and domestic travel was heavily restricted for the days following March 11. As a result, several airborne aircraft preparing to land were diverted to Yokota Air Base. The US Airbase provided the most optimal and safest landing area given its close proximity to Tokyo and the adequate standoff it provided from the crisis area. In total, 11 commercial aircraft were diverted to Yokota within 60 minutes of the quake and more than 500 civilians on carriers including United, Continental, and Delta, safely landed and processed through customs that day. The availability of its 2-mile long runway, large ramp space for parking, available fire crash response, and cargo and passenger handling facilities made Yokota an ideal safe haven for wayward aircraft. Even before the true extent of the damage was fully understood and recovery operations had commenced, the US military had already made a difference [14].

The use of US Intelligence, Surveillance and Reconnaissance aircraft beginning as early as March 12, had a significant role in building the baseline for response operations. Initial use of the RQ-4 "Global Hawk" Remotely Piloted Aircraft immediately following the crisis provided imagery of the highest resolution. These efforts, which continued throughout Operation TOMODACHI, provided the foundation for all other planning and response efforts. During Operations IRAQI FREEDOM, ENDURING FREEDOM (Afghanistan) and ODYSSEY DAWN (Libya), "drone" aircraft have repeatedly demonstrated their effectiveness across a full spectrum of operations. These airframes, however, has become controversial within the media and the public based on their easy application, sterile appearance, and the reduced risk of exposing our own servicemen and women to harm when it comes to setting the terms for combat. It is only necessary to look at the criticism President Obama has taken both at home and abroad for the application of Remotely Piloted Aircraft in Libya to see this principle in action. The use of these aircraft during TOMODACHI, provides a completely new paradigm within which to view its real value. The ability to use this platform for crisis response is unparalleled given the quality of imagery, rapid deployability, and the flexibility possessed. The application of unmanned aircraft within both international and domestic crisis response should be more openly considered when debating the long-term viability and ethics of the program as a whole [4,7].

From the outset, the strategic value of Sendai airport was understood given its close proximity to the Fukushima reactor sites while still remaining outside of the 20-Kilometer radiation exclusion zone. Once operational, the airport would serve as a major logistics hub just outside of the front lines of response operations. Unfortunately,

Sendai airport sat on the easternmost seaboard and was fully exposed to the damage caused by tsunami waves that pounded the coast. The US has demonstrated the capability to re-open airports with the utmost rapidity and precision in previous crisis. The opening of Utapao airport in Thailand immediately following the 2004 tsunamis in Indonesia and the activation of the Port-au-Prince Airport in Haiti in 2010 serve as distinct examples of this unique capability. The urgency to bed-down relief forces and mobilize logistics elements from Sendai called for a similar approach in Japan. Early hubs of Yokota Air Base and Naval Air Facility Atsugi were too far from the affected areas to provide direct support. A forward air refueling position was initially set up at Yamagata (much further inland than Sendai) but the winter weather and mountainous terrain between it and Tohoku made using it as a staging area unsustainable [11]. A few short days after the earthquakes, the US promptly mobilized the 320th Special Operations Tactics Squadron, out of Kadena Air Base, Okinawa, to survey and re-open Sendai. Upon its arrival, the unit encountered an airport that had essentially been written off by the GoJ. Robert Eldridge, Deputy Assistant Chief of Staff for the Marine Corps Bases Japan, following a site survey with Japanese leaders some days later stated, "If you were there and you saw it, you would have written it off, too." After landing in nearby Matsushima via airdrop on March 16, the team convoyed to Sendai to assess the damage. They encountered significant debris (including dozens of washed away cars) across the runways, taxiways, and parking ramps. Quick action by the team to begin clearing the area and in mobilizing several local Japanese work crews resulted in the clearance of the 5,000-foot runway in only 3 hours. This paved the way for the arrival of the first US MC-130 aircraft, loaded with 50,000 bottles of drinking water, the very next day. By the end of the week, much larger C-17s were landing as well.

Marines from the Combined Arms Training Center at Camp Fuji arrived at Sendai on March 20 to begin more extensive recovery operations. At the time of their arrival, the Marines had little idea that the airport would later become a key component to future response operations. Not only would it become the most critical logistics hub to the response, it would also be transformed into a US and GoJ bilateral coordination center. When the airport re-opened, there were about 107,000 people in Miyagi Prefecture living in shelters with little food or water while tens of thousands more still remained in areas devastated by the waves. A total of 19 makeshift morgues had popped up across Miyagi holding 744 unclaimed bodies. Supplies coming into Sendai were rapidly delivered by Japanese Self-Defense Forces and other authorities to local citizens. The Marines on the ground at Sendai wanted to do more to help but felt frustrated by their inability to do so. Their Commander, Colonel Craig Kozeniesky, described the Marines status shortly after getting to work at Sendai:

"Immediately upon getting here we started clearing cars and it fired up the airport staff to start working. Now, that the terminal area is cleared and the long-term parking area is about 80 percent clear, there is so much need, I think we can step off and do more and we are pushing aggressively to do that."

Ultimately, the level of aid provided by US forces was heavily dependent on the number of requests received from the Japanese government. By all accounts, the level of GoJ requests were fewer than many internal to DoD anticipated [7,15].

After the failure of both primary and alternate power production means at the Fukushima Plant, the Tokyo Electric Power Company and Self-Defense Forces battled tirelessly to keep constant water flow on the active fuel rods and expended fuel holding cells. These water

pumping activities were provided by fire trucks, adjacent water barges and helicopters that would hover over the plant (despite the rising radiation levels) to release water from above. Over the course of the event, 44 Japanese fire trucks pumped a total of 340 tons of water. The US military's provision of critical supplies and equipment were critical to these response operations. US forces provided six fire response vehicles with pumping systems, two barges loaded with freshwater and pumps, 100 radiation protective suits and nearly 18 tons of boric acid to help cool the reactors. Over the duration of response operations, US Forces and the US Energy Department also provided radiological testing and evaluation equipment to determine contamination and exposure levels.

All told, US Forces delivered 189 tons of food, 2 million gallons of water, and 87 tons of additional relief materials during response operations [4,11].

Leveraging Excellence for Future Operations

The bilateral coordination and success of Operation TOMODACHI should be codified in order to prepare for future crisis. The lessons and processes developed during this historic period must be leveraged by not only the US and GoJ but by the international community collectively to better posture response operations for the future. The demonstrated value of the US military during incidents such as the 2004 Indonesia tsunamis, 2010 Haiti earthquakes, and 2005 Hurricane "Katrina" in the Southern US, provide good reasons to shift the paradigm in terms of how we view and communicate the charter of the US military.

a. The value of maintaining US forces abroad

During the very well-publicized and currently ongoing US debt crisis, there have been many discussions aimed at reducing defense spending. In framing these discussions, it is imperative that we acknowledge the value of maintaining forces abroad and America's special role in the world. The US is a critical actor and its involvement overseas significantly enhances its strength in this world, rather than diminishes it. The US should embrace its responsibilities as a global leader and maintain the capabilities necessary to meet them. The permanent stationing of military personnel and equipment aided recovery operations. In total, the US delivered more than 3 times the amount of food and 20 times the volume of water than did the GoJ. The fact that US servicemen and assets were located on or adjacent to recovery operations saved an incalculable number of lives and expedited recovery operations. The US undeniable role in the world and value of having forces geographically able to support crisis such as TOMODACHI, UNIFIED ASSISTANCE (Indonesia) or UNIFIED RESPONSE (Haiti) should be acknowledged and quantified before committing to future basing and funding reductions.

b. The broad application and capabilities of remotely piloted aircraft

The use of unmanned aircraft during Operation TOMODACHI greatly assisted recovery operations. Despite their success, the DoD has done very little to build a public narrative that clearly articulates the wide-application of these airframes. Currently, much controversy swirls around these programs given their publicized use during Operation ODYSSEY DAWN in Libya. They are viewed by a portion of the public and many in the press as a very sterile and risk-free means of conducting warfare that the US would not conduct otherwise. A counter-narrative to these points should be built and communicated by DoD given the many other capabilities of Remotely Piloted Aircraft. Operation TOMODACHI provides the perfect opportunity.

From a more technical perspective, the DoD should analyze the same infrared thermography technology, used during radiation mapping operations, for potential application within unmanned aircraft. The capability of these systems to provide this function would reduce risk and exposure of US personnel to radiation contamination.

Voluntary assisted departure of US dependents

The DoS and DoD leadership should be praised for the decision to allow family members to voluntarily evacuate areas within 200 miles of the Fukushima Nuclear Plant. This decision was optimal given the complexity of the situation. It both suppressed concerns and discontent of US State and Defense department personnel, before they had the opportunity to surface, and demonstrated the US resolve and commitment to Japan. Many view the evacuation of family members within 200 miles as overly conservative given that radiation risks were not significant outside of a 20 mile radius. If the reactor situation worsened, the risk to US personnel grew. Also, the uncertainty of the weather patterns, the inability to contain airborne contamination and the potential effects to the indigenous water and food supply, provided enough rationale to evacuate on a voluntary basis. At the same time, the risks were remote enough and sufficient safeguards were in place to sustain families wishing to remain in country. In the end, the most critical factor was providing peace of mind to military members who remained in country to support relief operations – whether their families remained inside or outside of Japan. Also, the decision to voluntarily evacuate personnel early reduced total evacuation requirements in case a mandatory evacuation was required later on. Both the decision itself and the process used to develop this decision should be documented and used as a case study for future leaders.

Bilateral coordination – the good

The formalized Bilateral Assistance Coordination process developed by DoS and USAID should be replicated in future operations. This process ensured that relief provided was proportionate to the needs and capabilities of GoJ. Given the US previous experiences in dealing with countries of very limited means, it would have been easy to push US capabilities and operations on GoJ when they were neither required nor welcomed. Japan is a thriving economic, political, and military power in its own right. To overreach its bounds, the US may have caused Japanese leaders to “lose face.” A common critique among American servicemen was their belief that they could have done more had they been given the chance or had the Japanese requested additional support [9,15]. If perceived to be disrespected, Japanese leaders may not have accepted future relief. Further, unwanted advances could have very easily fractured or at least impaired long-term relationships between the two countries. In the end, the Bilateral Assistance Coordination process ensured the delicate balance between respecting GoJ leaders and helping the people of Japan was maintained.

The use of Bilateral Coordination Centers, once established, brought great success to the joint and international operation. While the established guidelines for Japan-US defense cooperation did not mandate the establishment of these centers, they provided a framework for discussion of technical issues related to nuclear response operations and allowed US forces to observe and learn from the strengths the Japanese Self-Defense Forces brought to the table. One example was the use of town hall meetings to communicate with citizens in needs.

Evolution of social media and its value during crisis response operations

The use of internet-based Social Media sites such as Facebook and

Twitter redefined response operations. This quick and easy form of communication allowed US citizens to communicate back home with families expediently. This provided peace of mind to US personnel and dependents and reduced the overhead required of the US Government to facilitate communications with family and friends back home. The development of similar sites by US forces provided quick and easy means of communications between those in and out of country [16].

Learning from Experience to Implement Changes in the Future

While identifying things that worked well often results only from more critical reflection and analysis, identifying problems or areas for improvement is typically much more obvious. Based on interviews and discussions with participants from Operation TOMODACHI, there were multiple common and recurring themes where changes are warranted. These areas should be adapted to better posture forces for future response operations.

a. Bilateral coordination – the bad

The establishment of the Bilateral Coordination Centers, although eventually effective, was not part of an existing Defense Cooperation plan. The improvised nature of the structure should eventually be addressed through a formulated coordination mechanism and the use of future Bilateral Coordination Centers should be discussed. Further, a more definitive process for roles and responsibilities and information sharing should be clarified. The time needed to clarify ad hoc capabilities between Japanese Self-Defense Forces and US Military Forces should be addressed through more specific guidelines. Additionally, the concept of Joint operations to support Humanitarian Assistance and Disaster Relief, based on a nuclear contingency, should be developed not only for Japan but abroad. The GoJ itself has acknowledged through multiple mediums that it had not considered and factored US capabilities into potential response operations. On June 21, 2011 both DoS and DoD Secretaries Clinton and Gates signed a security consultative document along with Japanese Ministers of Foreign Affairs and Defense. Although the document, titled Cooperation in response to the Great East Japan Earthquake, expressed the need for future bilateral coordination, it did not provide sufficient detail to ensure future effectiveness [12,17].

Command structure confusion

The establishment and swift implementation of the JTF-519 as the US lead military response command authority proved to be an effective command and control strategy. US Forces Japan did not have sufficient manpower to handle response activities. With many other operations occurring in unison, including ODYSSEY DAWN, NEW DAWN (formerly IRAQI FREEDOM) and ENDURING FREEDOM, the establishment temporary Task Forces specifically focused on TOMODACHI operations was an imperative. Eventually, however, the often overlapping roles and responsibilities between augmenting and pre-established personnel at US Forces Japan Headquarters made operations challenging. For example, messages identified specific responsibility sets for certain positions that ran counter to normal or previously established operations and what took place in reality. Further, there were multiple briefings and updates taking place that often overlapped and were unnecessarily redundant. Examples include Bilateral Update Brief between US Forces Japan and GoJ, Update Briefs between US Pacific Command and JTF-519, and Functional Component Command briefings to JTF-519. To further compound this confusion separate internet based processes and tools were used to up-channel information. Examples include All Partners Access Network,

Harmonieweb, Sharepoint, separate chat capabilities, and Defense Connect Online. These limitations should be addressed internally and codified for future implementation [10].

Radiological guidance and preparation

Over the last 15-20 years, US Forces have made strides in preparing for both chemical and biological attacks based on the prevailing threats. While many of the policies and standards for dealing with radiological contamination were still in place from the cold war, US forces had not practiced and were not prepared to employ them at a tactical level. The lack of a credible threat had led to diminished preparation in the arena of radiological contamination and response. Although radiological guidance is available, the data has been developed and provided by many separate organizations. The various sets of guidance are often contradictory in nature which in turn leads to confusion and uncertainty. Currently, separate standards exist for the Environmental Protection Agency, Defense Threat Reduction Agency, Department of Energy, Nuclear Regulatory Commission, World Health Organization, and Department of Defense – in fact many standards exist internal to DoD. During response operations, flightcrews received just-in-time guidance on the use of detection equipment, KI pills, decontamination processes and what constituted acceptable levels of exposure and contamination. As one individual stated, it was critical to know and convey exactly, “How clean is clean?” [16] Eventually, JTF-519 developed and provided a standardized matrix containing radiation threshold limits or cleanliness standards for relief operations. Even with the matrix initially being somewhat confusing and difficult to read for the forces on the ground, its development represented a major improvement for forces operating in a radiological environment. These same efforts should be reviewed and proactively accomplished and communicated for operating in chemical and biological environments as well [18].

The initial lack of a common body of knowledge for operating in a radiological environment, at a tactical level in the field, impacted operations. Specifically, the areas of detection, health protection, and decontamination for both ground and aircrews were disjointed and not particularly effective. Insufficient detection and protective equipment, early in the operation, drove unnecessary strain on US response operations. For example, the number of dosimeters and KI pills was initially very limited as were protective suits and masks. Further, some organizations assigned to enter Japan to augment TOMODACHI operations often did not bring protective equipment of their own. Air Mobility Command (AMC) served as an exception. AMC was responsible for much of the inter-theater transport operations both into and out of Japan during the crisis. The Command made a conscious effort to send protective gear with personnel travelling into country. They also provided dosimeters in case they encountered any significant level of contamination. If assigned to fly a mission into a contaminated area, they would receive all necessary equipment and just-in-time training before their mission. Ultimately, Operation TOMODACHI served as a major wakeup call to US forces – which had not extensively practiced or prepared for this type of contingency. US military leaders should use the experiences from TOMODACHI to both prepare for similar contingencies (both in Japan and abroad) and to identify and assume risk where warranted [19].

The Legacy

The events of March 11 will forever be remembered for the tragic loss of life, property and for the debilitating impacts to the morale of the people of Japan. The effects of the tsunami on the Fukushima

reactors nearly led to a catastrophic nuclear meltdown similar to the likes of Chernobyl or Three-mile Island. The actions of the men and women of the Japanese Self-Defense Forces and US Military Forces should be analyzed and modeled for the inevitability of future incidents. Likewise, the Office of the Secretary of Defense and the US Armed Services, during this time of projected budget cuts, should advertise the success of operations like TOMODACHI and articulate the peacetime implications of further budget reductions in the context of crisis response capability. In protecting budget lines, the Military Services must use more than traditional wartime capability requirements to advocate funding lines. Building a public narrative to describe the impacts of funding cuts to crisis response would help to re-frame the argument which is now solely centered on recent operations in Iraq and Afghanistan. Much like any political argument, the retention of military capability should appeal to the public's emotions rather than a more rational or quantitative appeal. Magnifying the efforts like Operation TOMODACHI would help to support that effort. To think of the US, given its very special role in this world, without the capability to respond during a time of crisis, would not sit well with the preponderance of US citizens and therefore the members of our Congress (regardless of ideology). In the end, Operation TOMODACHI is a bright and glowing example of the ability of US agencies collectively, and specifically our Armed Forces, to do much more than simply wage war.

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