NPS-LM-14-181

ACQUISITION RESEARCH PROGRAM SPONSORED REPORT SERIES

Analyzing Resources of United States Marine Corps for Humanitarian Operations

26 August 2014

Dr. Aruna Apte, Associate Professor

Dr. Keenan Yoho, Assistant Professor

Graduate School of Business & Public Policy

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

The research presented in this report was supported by the Acquisition Research Program of the Graduate School of Business & Public Policy at the Naval Postgraduate School.

To request defense acquisition research, to become a research sponsor, or to print additional copies of reports, please contact any of the staff listed on the Acquisition Research Program website (www.acquisitionresearch.net).

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

Abstract

In order to improve the effectiveness of the United States Marine Corps (USMC) response to Humanitarian Assistance and Disaster Relief (HADR), the capabilities of the USMC will need to be matched to the demand created by future disasters. In this research, we study the USMC resources that are primarily responsible for the response, the Marine Expeditionary Unit (MEU). We study recent HADR events to determine how demands were met by the USMC. We identify the supplies by examining both assets and capabilities. We explore significant gaps, if any, that can be improved by the USMC MEU.

Keywords: USMC, humanitarian assistance and disaster relief

THIS PAGE INTENTIONALLY LEFT BLANK

About the Authors

Dr. Aruna Apte is an associate professor in the Operations and Logistics Management Department of the Graduate School of Business and Public Policy at the Naval Postgraduate School in Monterey, CA. Her research interests are in the areas of developing mathematical models and algorithms for complex, real-world operational problems using techniques of optimization.

Dr. Aruna Apte
Tel: (831) 656-7583
E-mail: auapte@nps.edu

Dr. Keenan Yoho's primary research activities are in the area of analysis of alternatives for capital purchases under conditions of resource scarcity, supply chain management, risk analysis, humanitarian assistance and disaster response, and resource management in environments that exhibit high degrees of uncertainty. Prior to joining the Naval Postgraduate School, Yoho was an operations researcher and principal investigator with The RAND Corporation, where he led studies for the Army, Air Force, and TRANSCOM to improve the effectiveness of logistics, acquisition, and sustainment operations and to develop policy guidance for supply chain operations. Yoho has several years of experience teaching and developing master's students and executives in the U.S. and Europe in principles of supply chain management and manufacturing operations. He has served as an intelligence analyst for the U.S. Customs Service in the area of international money laundering and has worked large litigation cases representing Lloyd's of London in insurance defense. He was the National Research Coordinator for Manufacturing Skills Standards as part of an initiative funded by the United States Congress to develop national skill standards for the U.S. industrial manufacturing economic sector. He has advised U.S. and European firms for several years in the petrochemical, semiconductor, paper and pulp products, and steel industries, focusing on enabling corporate strategy by using the supply chain as a competitive weapon. Yoho holds a PhD in operations management, an MBA in operations and information management, and an MS in industrial relations from the University of Wisconsin-Madison. He also holds a BA in religion with a concentration in Chinese and Japanese Buddhism from Temple University.

Dr. Keenan D. Yoho
Tel: (831) 656-2029
E-mail: kdyoho@nps.edu

THIS PAGE INTENTIONALLY LEFT BLANK

NPS-LM-14-181

ACQUISITION RESEARCH PROGRAM SPONSORED REPORT SERIES

Analyzing Resources of United States Marine Corps for Humanitarian Operations

26 August 2014

Dr. Aruna Apte, Associate Professor

Dr. Keenan Yoho, Assistant Professor

Graduate School of Business & Public Policy

Naval Postgraduate School

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

THIS PAGE INTENTIONALLY LEFT BLANK

List of Figures

THIS PAGE INTENTIONALLY LEFT BLANK

List of Tables

THIS PAGE INTENTIONALLY LEFT BLANK

Analyzing Resources of United States Marine Corps for Humanitarian Operations[1]

Introduction

The United States Marine Corps (USMC) can rapidly respond to disasters due to high levels of readiness that are maintained on a constant basis. This research explores the resources of the USMC and how they may be employed to increase effectiveness and efficiency. Apte, Yoho, Greenfield, and Ingram (2013) studied the assets of the United States Navy (USN) and analyzed the USN disaster relief operations. By exploring USMC operations for similar instances, we analyze the historic data for deployment of the hard assets—equipment and associated personnel, and capabilities as soft assets. In the current economic environment, the realignment and restructuring of the forces and services, there is a need for research identifying specific naval resources and their utility to conduct humanitarian operations.

As the United States (U.S.) military exits Afghanistan and prepares for a likely period of peacetime, non-combat operations provide a means for combatant commanders to engage in theater shaping. The USMC provides critical resources for these missions through their Marine Expeditionary Units (MEUs) that are flexible and adaptable to accomplish a wide range of operations, including non-combat missions. Given the recent frequency of disasters around the world, it is probable that the occurrence of these events will continue, thus creating a demand for the relief capabilities inherent to the MEUs that include deployable, flexible, and adept forces into austere environments while meeting urgent timelines (USMC, 2009).

By seeking to reduce redundancy and focus on capabilities that are unique and/or provide an unfulfilled demand, the MEUs will provide more effective relief and reduce the effects of a disaster. Although the MEU response will undoubtedly provide aid and relief, it is critical that the USMC allocates its resources effectively to act at any given time.

In this research, we explore the capabilities of the USMC, in particular the MEU, that satisfy the demand induced by disaster traits (Apte et al., 2013). We follow the framework discussed by Apte et al. (2013) and by Apte and Yoho (2012) for studying the USMC capabilities to match the supply with the demand from certain

[1] This research was conducted in conjunction and collaboration with Capt. Jared Gastrock and Capt. Juan Iturriaga, USMC. The MBA report associated with this article is “Analysis of United States Marine Corps Operations in Support of Humanitarian Assistance and Disaster Relief,” Capt. Jared R. Gastrock and Capt. Juan J. Iturriaga, U.S. Marine Corps, MBA Student Report, Advisors: Aruna Apte and Keenan Yoho.

past disasters. We compile and analyze data from multiple USMC publications, historical records of disasters, and the responses to those disasters. The resulting analysis sheds light on resources and capabilities of the USMC MEU capabilities to conduct Humanitarian Assistance and Disaster Relief (HADR) missions. The different capabilities studied are information and knowledge management, needs assessment, supply, deployment and distribution, health service support, and collaboration and governance (Apte & Yoho, 2012) for the disasters selected. We have selected the 2007 cyclone on the southwest coast of Bangladesh, the 2010 Haiti earthquake, and the 2011 Japan earthquake and tsunami for collection of the data. We selected these disasters because of their impact and the level of involvement of the USMC in relief operations. Figure 1 describes our research process model in terms of the overall process of our data collection and analysis.

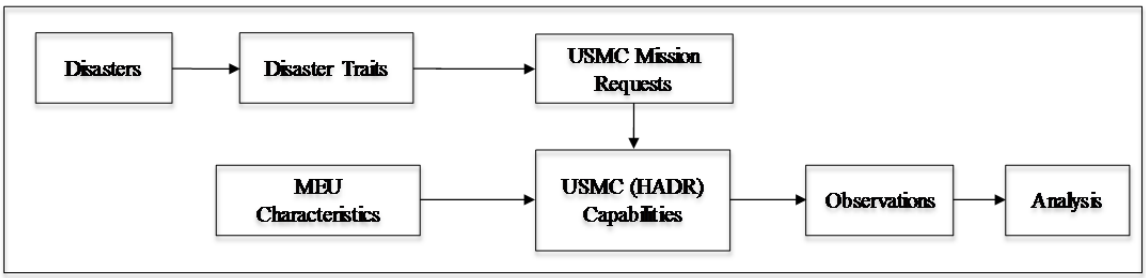

Figure 1. Research Process Model for Data Collection and Analysis

Our present study makes a significant contribution to the academic literature in that it is the second organization being analyzed in terms of the capabilities for HADR. Based on previous studies, we identify specific USMC resources and capabilities with their utility for conducting disaster relief operations (Apte et al., 2013). This research should stimulate further work to explore capabilities and competencies of other services and organizations in the private as well as public sector to be utilized in HADR.

The article is organized as follows. In the next section, we describe capabilities and resources needed for HADR operations. Following that, we discuss the supply from the USMC, and then the demand for relief requirements from the three disasters. The next section includes our observations about the response from the USMC. In the final section, we offer the conclusion.

Capabilities and Resources

Disasters initiate responses that have to satisfy a wide range of needs. Tomasini and Van Wassenhove (2009), Apte (2009), and Kovács and Spens (2007) describe the activities that are critical to delivering relief to fulfill the demands of those affected. The activities, as shown in Figure 2, include information and knowledge management; needs assessment; supply, deployment and distribution; health service support; and collaboration and governance (Apte & Yoho, 2012).

Collecting and organizing information and analyzing this collected information into knowledge have two advantages. The short-term benefit is that it leads to making appropriate plans to provide relief. The long-term value is that the knowledge retained helps in needs assessment across many disasters.

Needs assessment is intelligence-gathering for military organizations. This is done through specific types of methods to develop an operational picture through requirement generation. Fusion of electronic data, human intelligence gathering, and imagery help the people involved understand what capabilities are needed to accomplish the specific mission. Needs assessment is critical for matching appropriate resources to the demand through capabilities of the available organizations. (Apte et al., 2013).

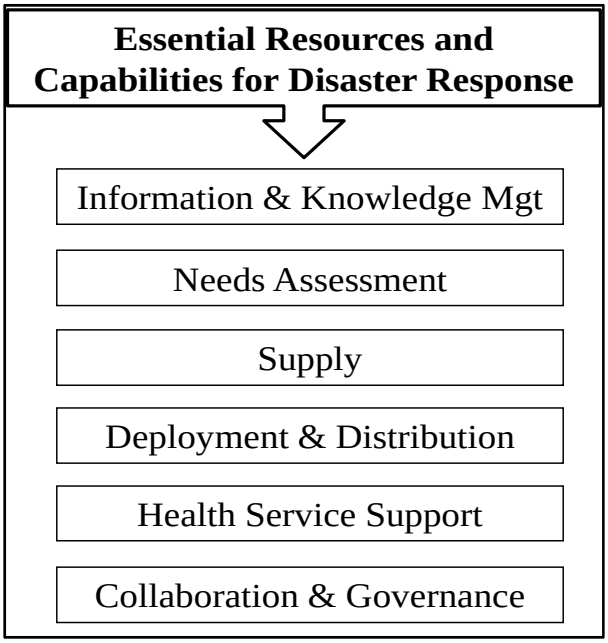

Figure 2. Essential Resources and Capabilities Studied for USMC (Apte & Yoho, 2012)

The USMC has certain pre-positioned supplies and determines usability and suitability before deploying any supply. The supply network facilitates the response by including procurement, storage, and maintenance of the USMC assets. Organic assets, as well as the capability for resupply, greatly influence the scope and duration of relief operations, ultimately determining the flexibility of response (Apte & Yoho, 2012).

Transporting supplies to the end user is the overall goal of deployment and distribution for the USMC. This capability is referred to as *lift*, or the ability to transport personnel, goods, and equipment from staging areas to the disaster area and distribution locations (Apte & Yoho, 2012). Naval services utilize the ocean as a maneuver area to establish sea basing capability on ships and then employ sealift and airlift platforms to deliver aid to the end user, with rotary-wing airlift assets providing the most flexibility (Apte et al., 2013).

Health services support is provided to prevent further loss of life and relieve pain and suffering because most disasters cause loss of life and casualties, as well as displaced persons. Large-scale medical operations involve naval hospital ships but are extremely cost intensive (Ures, 2011). Less costly but effective options include field hospitals and medical personnel imbedded with ground units to provide individual care.

Collaboration and governance afford responders to coordinate efforts and increase efficiency. HADR operations most often include collaboration among military organizations, private sector, and non-government organizations (NGOs), as well as host nation governments. This is a difficult task even in normal circumstances. Given that all the organizations are operating in a chaotic and dynamic environment, without deliberate collaboration and coordination, relief efforts are unlikely to achieve the highest effectiveness possible (Apte & Yoho, 2012). Furthermore, a well-defined command structure working with local governments, authorities, and community members facilitates the successful completion of missions planned. Figure 3 shows the relationship between military and non-military capabilities and how they fulfill the required capabilities in support of a disaster.

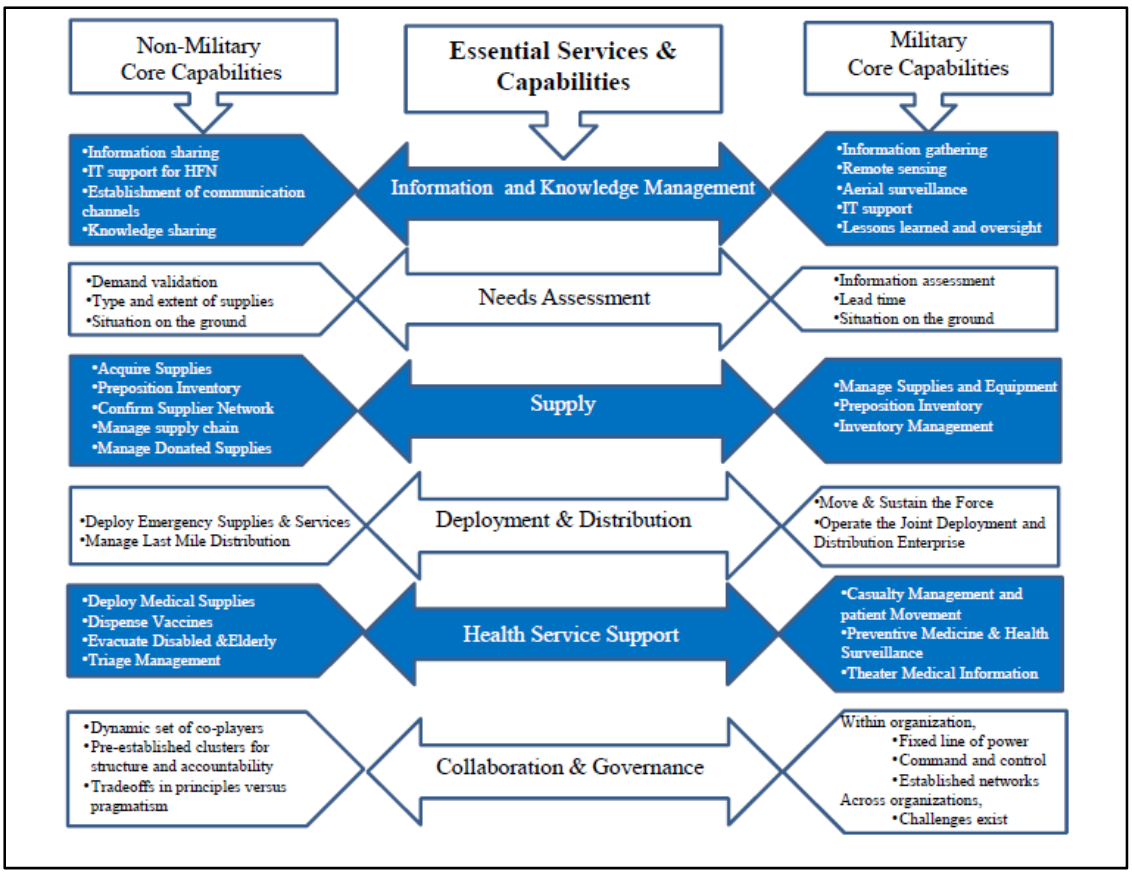

Figure 3. Humanitarian and Military Core Competencies

Note. This figure was adapted from Joint Publication 4-0 (2008) and Apte & Yoho (2012).

The Supply for Humanitarian Assistance and Disaster Relief

Response to any level of disaster must accomplish several capabilities to meet a wide range of demands for HADR relief. Apte et al. (2013) described the matching of USN capabilities to meet the demand brought on by the disaster traits of the 2004 tsunami in the Indian Ocean, the 2005 Hurricane Katrina, and the 2010 earthquake in Haiti, thus executing the response supply chain. This supply chain of response is also a critical factor in determining overall capability for the lift (Apte & Yoho, 2012). Naval Services exploit their environment to establish distribution in supplying relief to the affected area with rotary-wing airlift in order to adapt to the dynamic nature of the supply chain (Apte & Yoho, 2012). A well-managed supply chain is a major enabler to response and extends further than just what the responder is equipped with (Apte & Yoho, 2012).

Suppliers of capabilities

Certain capabilities of an organization that engages in HADR supply the necessary relief, in terms of products and services, to disaster-struck areas. The generation and dissemination of information is the first step in preparing an appropriate plan to provide relief in the wake of a disaster. This capability provides the responder with the critical information it needs to get the right support to the right place and the right people (Apte, 2009). Needs assessment seeks to determine what type of demand and how much of it exists so that appropriate aid can be delivered (Apte & Yoho, 2012).

Virtually all disasters cause loss of life and casualties, as well as displaced persons. Accordingly, health services support must be provided to prevent further loss of life and relieve pain and suffering (Apte & Yoho, 2012; Apte et al., 2013). Finally, collaboration and governance provide responders with a means to coordinate efforts and increase efficiency. HADR operations are conducted normally in extreme conditions with participation from diverse organizations. Carefully planned collaboration and coordination is one of the primary paths to accomplish effectiveness and efficiency (Apte & Yoho, 2012). The resources for supply in the general context of HADR (previously shown in Figure 2) can be studied to understand the specific capabilities of the MEU.

Marine Expeditionary Unit: the Supplier

The MEU is a rapid-response force whose mission is to provide a forward-deployed, flexible, sea-based Marine Air Ground Task Force (MAGTF) capable of conducting amphibious operations, crisis response, and limited contingency operations. These enable the introduction of follow-on forces and designated special operations in order to support the theatre requirements of geographic combatant commanders (GCCs; USMC, 2009, p. 4). Such capabilities and resources encompass, indirectly, most of the broad spectrum of capabilities discussed earlier. Disasters, such as hurricanes and cyclones, strike coastal areas with a higher frequency just due to the geography as shown by history. Because the USMC policy dictates that the MEU must possess five characteristics to ensure mission readiness, the significant one being that the MEU must accomplish a sea-based forward presence. In the past, earthquakes have occurred in countries (Indonesia, Haiti, Japan) in close proximity to the ocean. The earthquake-prone areas are located significantly near water. This creates a high risk of tsunami. Due to these circumstances, the MEU capable of amphibious operations is on par with the USN. Disaster, of any type (Apte, 2009), demands crisis response, and contingency operations. These specific demands tie into the capabilities of the MEU and make them one of the critical suppliers of HADR.

The USMC has a minimum of three MEUs deployed throughout the world. The 31st MEU is stationary in Okinawa, Japan. The other two are sourced from three MEUs on the east and west coast of the continental United States. The 22d, 24th, and 26th MEUs are located in Camp Lejeune, NC; and the 11th, 13th, and 15th MEUs are based out of Camp Pendleton, CA (USMC, 2009).

Regardless of the geographic location of the mission, the MEU must be able to operate within the designated area of responsibility (AOR), independent of support from other nations. This is accomplished through the MEU's use of naval platforms and a naval amphibious ready group (ARG) to provide mobile basing for global operations (USMC, 2009).

The Demand from Disasters

We now discuss three disasters in context of the response by the USMC. These disasters are selected because they offer diversity in terms of the type of disaster (such as sudden or slow-onset; Apte, 2009) and the condition of the affected host country (such as poverty, governance, development, etc.). Limitations on the availability of data and information were partially responsible for the choice.

Cyclone, Bangladesh, 2007

On November 15, 2007, the southwest coast of Bangladesh was ravaged by a tumultuous cyclone, which caused high winds and flooding. Figure 4 offers a glimpse into the devastation.

Figure 4. 2007 Cyclone in Bangladesh

As a result, over 3,200 people were killed, and an estimated 40,000 were injured (Command Element, 3rd Marine Aircraft Wing [CE 3D MAW], 2008). The day after the cyclone struck, U.S. Pacific Command (PACOM) issued Tasking Order P-137 that resulted in the assigning the Kearsage Expeditionary Strike Group (ESG) and the 31st MEU (CE 3D MAW, 2008). Table 1 gives the overview of the devastation in Bangladesh.

	2007 Bangladesh Cyclone
Deaths	>3,200
Injured	>40,000
Missing	>1,000
Displaced	>3,000,000
Damage	1.6 million acres of farmland destroyed, 350,000 head of livestock killed
	Fresh water sources severly contaminated by salt water and debris
	Loss of electricity and communication lines in affected districts
	2.3 million households affected, including 1 million seriously affected
	8,000 km of roadways and 2,000 km of waterways devastated

Table 1. **Overview of the Devastation in Bangladesh**

Earthquake, Haiti, 2010

On January 2, 2010, an earthquake struck 14 miles away from the capital city of Port-au-Prince, Haiti, registering a 7.0 on the Richter scale. Figure 5 offers a glimpse into the devastation.

Figure 5. 2010 Haiti Earthquake

It is estimated that 230,000 people were killed and 197,000 injured (Command Element, II Marine Expeditionary Force [CE II MEF], 2010). After receiving verbal order from the Joint Forces Command (JFCOM), II MEF prepared the 22d and 24th MEUs for deployment to Haiti. The MEUs were assigned to two

ARGs, several other USN units, as well as African Partnership Station 10 (APS-10). Table 2 gives an overview of the devastation in Haiti.

	2010 Haiti Earthquake
Deaths	92,000-220,000 estimated
Injured	>250,000
Missing	>20,000
Displaced	>1,100,000
Damage	Destruction of all five medical facilities around Port-au-Prince
	Destruction of Toussaint L'Ouverture International Airport
	Considerable damage to communication infrastructure
	Major damage to roadways by debris
	Major damages to the Port-au-Prince seaport, rendering it unusable for immediate rescue

Table 2. **Overview of the Devastation in Haiti**

Earthquake and Tsunami, Japan, 2011

On March 11, 2011, mainland Japan suffered an earthquake that registered 8.9 on the Richter scale and caused a tsunami, which struck the north Pacific coast of Japan and measured over 30 feet at its highest point (Command Element, 3d Marine Division [CE 3D MARDIV], 2011). Figure 6 shows a glimpse of the devastation. The disaster killed 14,898 people, injured 5,270 more, and left almost 10,000 unaccounted for. On March 12, the commanding general of U.S. Forces Japan authorized III MEF, along with the 31st MEU, to deploy the first part of responders to the disaster area (Command Element, 3D Marine Expeditionary Brigade [CE 3D MEB], 2011). Table 3 gives the overview of the devastation in Japan.

	2011 Japan Earthquake/Tsunami
Deaths	>14,898
Injured	>5,270
Missing	>10,000
Displaced	>300,000
Damage	Meltdown of Fukushima nuclear power plant Sendai Airport, Uranohama and Kesenumma-Oshima Seaports overwhelemed with debris Widescale power outages and destruction of hard line communications Majority of small structures, personal property and lines of transportation affected area destroyed

Table 3. **Overview of the Devastation in Japan**

Figure 6. 2011 Japan Earthquake and Tsunami

Discussion

We now discuss the responses by the USMC and the unmet demand of the three disasters: the 2007 cyclone in Bangladesh, the 2010 Haiti earthquake, and the 2011 Japan earthquake and tsunami.

Vignettes of the Response by the USMC

Information and Knowledge Management

Haiti received substantial humanitarian assistance from the USMC. MV-22 Osprey aircrafts were used by the 24th MEU to survey the damage of the earthquake. After the notification of the disaster of the 2011 Japan earthquake, III MEF formed a crisis action team that started to gather information.

Needs Assessment

In response to the Bangladesh cyclone, a humanitarian assistance survey team (HAST), in conjunction with the United States Agency for International Development (USAID), assessed the situation on the ground and developed plans for execution by the consequent responders that were to follow.

In Haiti, after the earthquake, the MEU completed assessment of affected areas and dispelled false reports of damage in northern Haiti. The 24th MEU also completed assessments of infrastructure in the northern area of Haiti and an assessment of relief distribution capabilities in the southern portion of the country (CE II MEF, 2010).

After receiving the news of the Japan earthquake, the USMC started to plan the process and resource assessment in support of generating a response plan to the disaster (CE 3D MEB, 2011). The HASTs from the forward command element (FCE) assessed that the host nation response plan was well organized and that an effective strategy was in place. However, even with their years of training and preparation, Japanese responders were overwhelmed by the size of the disaster (CE 3D MEB, 2011).

Supply

In response to the Bangladesh cyclone, 3D Marine Expeditionary Brigade (MEB) began providing water distribution. In addition, storage facilities were also provided.

The USMC task force established sea-based operations in Haiti from which the Marines managed a hub-and-spoke–style distribution network of relief supplies, such as food and water.

Standing up of the airport in Japan enabled the delivery of over 872 tons of supplies, including water, food, and hygiene kits (CE 3D MEB, 2011). As a continuation of infrastructure recovery, the FCE engaged and facilitated the delivery of critically needed fuel; clearing of debris from schools for use as shelters, as well as from the Kesenumma-Oshima seaport; clearing of debris from the Sendai-Tohoku

Shinkansen railroad station; and the restoration of power to the Oshima Islands (CE 3D MEB, 2011).

Deployment and Distribution

In response to the Bangladesh cyclone, 3D MEB provided overall support for distribution and lift. The USMC proposed establishing a secondary logistics distribution center along the southeast coast of Bangladesh to provide further support. Upon denial by the government of Bangladesh, only one primary debarkation point was utilized during the relief operation (CE 3D MAW, 2008).

The strategy of distribution of Joint Task Force–Haiti (JTF-H) was to use the MEUs' rotary-wing assets to distribute food and water supplies using a hub-and-spoke distribution model while providing a steady state of supply (CE II MEF, 2010).

In Japan, the FCE provided assistance by creating Task Force Fuji, which consisted of a logistically focused group sourced from Combat Logistics Regiment 35 from Marine Corps Base, Camp Butler, Okinawa, Japan, among other contributors (CE 3D MEB, 2011). The task force assumed the heavy lift and equipment requirements of the airport recovery, allowing the 320th Squadron members to focus on other vital reconstruction areas. This facilitated the rapid completion of the project, and the airport was reopened in a matter of days.

Health Service Support

In response to the Bangladesh cyclone, 3D MEB began delivering preventive and primary medical care.

Collaboration and Governance

After providing the humanitarian aid in Haiti, the goal of U.S. involvement was to prevent the loss of life, then facilitate the existing charities' efforts to rebuild the affected area (CE II MEF, 2010). During the initial phase, JTF-H was established with a command and control capability that provided liaison opportunity between the U.S. military, diplomatic leadership, the USAID, and the United Nations Stabilization Mission in Haiti. This command and control organization also established a humanitarian aid coordination center to manage the relief efforts of the government of Haiti, the USAID, the United Nations, and NGOs providing relief to the disaster (CE II MEF, 2010).

Tables 4, 5, and 6 summarize the response provided by the USMC through each capability and resource.

	Demand met by USMC
Information and knowledge management	Unclassified and plain text communications
	Public affairs liasons
Needs assessment	Initial HAST
Supply	Potable water
Deployment and distribution	Delivery of water purifiers and supplies from USAID via rotary wing aircraft and LCACs
Collaboration and governance	HAST coordination
	Establishment of joint HLZs
	Inclusion of host nation and NGOs in planning process

Table 4. **Bangladesh cyclone response by USMC**

	Demand met by USMC
Information and knowledge management	Unclassified and plain text communications
Needs assessment	Troop contact and info gathering with victims
	Recon teams for remote assessments/HLZ ID
	Rotary aircraft assessment
	Infrastructure assessment
Supply	Fuel, drinking water, food, medical supplies
	Manpower for sea and air port security
Deployment and distribution	Air and ground delivery of supplies
Health service support	Basic aid to remote populations
Collaboration and governance	Civil affairs officer as liaison
	Collaboration with JTF-H, NGOs and USAID

Table 5. **Haiti Earthquake Response by USMC**

	Demand met by USMC
Information and knowledge management	Social media
	Unclassified and plain text communication
	Rotary wing imagery
	Creation of crisis action planning team
Needs assessment	Initial HAST
	Rotary wing aerial surveys
Supply	Manpower and equipment for debris clearance
	Fuel
Deployment and distribution	Helicopter lift of supplies and personnel to JSDF
	Trucks
Collaboration and governance	Exchange of embedded liaison teams with JSDF

Table 6. **Japan earthquake and tsunami response by USMC**

The Unmet Demand

We now list the relief that was not provided. We do not delve into the reasons. However, we summarize the unmet demand for each disaster based on the capabilities and resources. Tables 7, 8, and 9 summarize the unmet demand at each of the disasters discussed.

	Unmet Demand
Information and Knowledge Management	Means of mass communication to public
Needs Assessment	
Supply	Drinking water during initial releif
Deployment and Distribution	Tactical distribution sites with security
	Distribution to isolated locations
	Trucks
Health Service Support	Mobile medical teams
	Interpreters
	Immediate care facilities
	Disease monitoring in remote areas
Collaboration and Governance	Accurate information from host nation
	Clear procedures from DOS
	Clear areas of responsibility
	Collaboration between host nation and NGO's

Table 7. **Unmet demand for Bangladesh cyclone**

	Unmet demand
Information and knowledge management	Cell phones and personal communication
Needs assessment	Remote location assessment
Supply	Generators and fuel
	Hygiene supplies
	Security of distribution routes and points
	Civil order/governance
	Safety at refugee camps
	Debris clearance
	Trucks, ambulances, heavy equipment
Deployment and distribution	Dissemination of releif facilities
	Distribution lift capabilities
	Landing capacity for fixed wing aircraft
Health service support	Latrines and sanitation facilties
	Mortuary services
	Medical supplies and personnel
Collaboration and governance	Functioning government
	Personnel at NGO's coordination cell
	Large scale response collaboration

Table 8. **Unmet demand for Haiti earthquake**

	Unmet Demand
Information and knowledge management	Validated and accurate information
	Accurate, timely and understandable radiation reports
Needs assessment	Accurate radiation measurments
Supply	Manpower and equipment for search and rescue and debris clearance
	Restoration of electricity
	Initial, food, water, clothing, shelter
	Radiological detection
	Civil order
Deployment and distribution	Trucks
Health service support	Care for children, elderly, sick and poor
Collaboration and governance	Large scale coordination of government and NGOs
	Timely acceptance of aid -Unity of effort between Japanese Govt, TEPCO and foreign aid.

Table 9. **Unmet demand for Japan earthquake and tsunami**

Conclusion

Through an analysis of responses provided by the MEU and an assessment of the remaining unmet demands following each disaster, we determined which capabilities and resources the MEU could have provided to fulfill those unmet demands. These are given in Table 10.

	MEU capabilitties to satisfy unmet demand
Information and knowledge management	S2 Intelligence section
	S6 Communications section
	Rotary wing aircraft for mass distribution of info materials
	Civilian affairs section
	Public affairs section
Needs assessment	CBRN Detachment
	Reconnaissance platoon
	Force Reconnaissance platoon
	Infantry Battalion of Marines
Supply	(2) Tactical water purifiers
	Infantry Battalion of Marines
	Military Police Detachment
	(4) Forklifts, (1) Bulldozer, (1) Excavator
	(31) MTVR Trucks, (105) HMMWV, (15) AAV
Deployment and distribution	(19) Rotary wing aircraft, (2) C-130
	(31) MTVR Trucks, (105) HMMWV, (15) AAV, (4) Forklifts
Health service support	Embedded Navy corpsmen
Collaboration and governance	Civil affairs section
	Public affairs section

Table 10. **MEU capabilities for unmet demands across the disasters**

The unmet demands from the three disasters that we studied suggested potential capabilities MEU can employ to accomplish better HADR. Information and knowledge management capabilities fell short due to the absence of ability to communicate to masses. This was extenuated by inadequate technology, such as mobile devices and fidelity of information. Both could have been mitigated by the MEU's S2 intelligence section and S6 communication section. In addition, MEU's MV-22 Ospreys, CH-53, and UH-1 helicopter could have distributed mass notification.

Needs assessment was inadequate due to incomplete data from remote and isolated areas. This could have benefited from an infantry battalion of MEU, which has capabilities of reaching, geographically and figuratively, such areas. Inaccurate detection of radiation levels at the Fukushima Power Plant need not have been an issue because the MEU's Chemical Biological Radiological Nuclear (CBRN) section could have been of help, at least in certain areas.

Distribution of critical supplies can be done without looting, violence, or unrest because the USMC's manpower resources offer many solutions. Specifically, the

military police platoons are proficient in restoring order and providing security. In addition, the sheer presence of Marines is likely to have influence in preventing crime against the most vulnerable people, such as children, the elderly, and the sick.

As per capability to supply, the MEU's two tactical water purifiers can alleviate water shortage until other relief organizations arrive. Though the relief supply distribution offers many challenges, ground transportation is a substantial capability of the MEU due to its hard assets, such as 31 seven-ton trucks, 105 HMMWVs, and 15 AAVs. For the loading and unloading of the cargo, the four forklifts also are significantly useful. It should be noted that the absence of forklifts was a major deterrent in relief distribution during the 2004 Indian Ocean tsunami in Banda Ache (Apte, 2009). The MEU's 19 rotary-wing aircrafts, an unparalleled resource, can help delivering the supplies to area inaccessible by land transportation. Such last-mile distribution will be a great enabler for smaller NGOs in the future HADR operations.

We also conclude, based on our observations, that there was an overall deficiency in medical support. In the future, it could be partially removed by embedded Navy Corpsman with Marine ground troops. Last, but definitely not the least, the MEU's civil affairs and public affairs sections can improve collaboration and coordination. Such effort will allow the MEU to better match the capabilities and resources with the demands of the victims in the affected areas.

After evaluating the overall response to the three disasters, we concluded that the MEU's information assets, including aerial, human, and ground intelligence, are effective at developing an operational picture of the environment immediately following a disaster. When shared and validated via a non-classified network, this information can increase the situational awareness of all stakeholders and improve overall response. MEU aerial assets, especially rotary wing aircraft, as well as ground troops, have proven effective at determining demand for relief. Although using push logistics on a macro scale, the MEU can use these assessments to tailor their actions to respond to the pull of demand on the ground. The supply of critical goods such as food and drinking water are always in high demand with the onset of the disaster. The MEU can meet these immediate needs, but, furthermore, the Marines are capable of establishing security and stability, conducting search and rescue operations, debris clearance, and basic medical care.

Like most military organizations, the MEU excels at deployment and distribution through the use of amphibious and especially rotary wing assets and manpower. This provides the ability to lift and distribute assets within an austere environment when other organizations cannot. Accordingly, the MEU presents tremendous potential to multiplying the effectiveness of other responders. While conducting HADR operations, the MEU provides health services in the form of embedded Navy medical personnel, casualty evacuation, as well as chemical,

biological, radiological and nuclear disaster response. Notably, an embedded Navy corpsman is able to treat injuries in remote and isolated areas that are not covered by most responders. Finally, the clearly defined command structure of the MEU can successfully liaise with the host nations and other organizations to enhance overall relief operations by promoting collaboration and governance through communication and information dissemination.

THIS PAGE INTENTIONALLY LEFT BLANK

References

Apte, A. (2009). Humanitarian logistics: A new field of research and action. *Foundations and Trends® in Technology, Information and OM, 3*(1), 1–100.

Apte, A., & Yoho, K. (2012, September). *Capabilities and competencies in humanitarian operations* [Acquisition Research Sponsored Report Series]. Monterey, CA: Naval Postgraduate School, Graduate School of Business and Public Policy. Retrieved from http://www.acquisitionresearch.net/files/FY2012/NPS-AM-12-175.pdf

Apte, A., Yoho, K., Greenfield, C., & Ingram, C. (2013). Selecting maritime disaster response capabilities. *Journal of Supply Chain Management, 6*(2), 40–58.

Command Element, II Marine Expeditionary Force (CE II MEF). (2010, August). *Humanitarian assistance/disaster relief Operations Unified Response* (ID 13078). Retrieved from Marine Corps Center for Lessons Learned website: https://www.mccll.usmc.mil/index.cfm?disp=servefile.cfm&fileType=CDR&ID=13078&repositoryDirectory=MCCLL_REPORTS

Command Element, 3D Marine Division (CE 3D MARDIV). (2011, May). *After action report for Operation Tomodachi* (ID 15694). Retrieved from Marine Corps Center for Lessons Learned website: https://www.mccll.usmc.mil/index.cfm?disp=servefile.cfm&fileType=CDR&ID=15694&repositoryDirectory=AARs

Command Element, 3D Marine Expeditionary Brigade (CE 3D MEB). (2008, February). *Bangladesh humanitarian assistance/disaster relief (HADR): Operation Sea Angel II lessons learned* (ID 19879). Retrieved from Marine Corps Center for Lessons Learned website: https://www.mccll.usmc.mil/index.cfm?disp=servefile.cfm&fileType=CDR&ID=19879&repositoryDirectory=AARs

Command Element, 3D Marine Expeditionary Brigade (CE 3D MEB). (2011, June). *Operation Tomodachi after action report & assessment* (ID 16190). Retrieved from Marine Corps Center for Lessons Learned website: https://www.mccll.usmc.mil/index.cfm?disp=servefile.cfm&fileType=CDR&ID=16190&repositoryDirectory=AARs

Command Element, 3rd Marine Aircraft Wing (CE 3D MAW). (2008, February). *Bangladesh humanitarian assistance/disaster relief (HADR): Operation SEA ANGEL II operational summary* (ID 19880). Retrieved from Marine Corps Center for Lessons Learned website: https://www.mccll.usmc.mil/index.cfm?disp=servefile.cfm&fileType=CDR&ID=19880&repositoryDirectory=AARs

Greenfield, C. M., & Ingram, C. A. (2011). *An analysis of US Navy humanitarian assistance and disaster relief operations* (NPS-LM-11-009). Retrieved from http://www.acquisitionresearch.net/files/FY2011/NPS-LM-11-009.pdf

Kovács, G., & Spens, K. M. (2007). Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management, 37*(2), 99–114.

Tomasini, R. M., & Van Wassenhove, L. N. (2009). *Humanitarian logistics*. New York, NY: INSEAD Business Press.

United States Marine Corps (USMC). (2009, August). *Policy for Marine expeditionary units (MEU) and expeditionary units (special operations capable) MEU (SOC)* (MCO 3120.9C). Retrieved from http://www.marines.mil/News/Publications/ELECTRONICLIBRARY/ElectronicLibraryDisplay/tabid/13082/Article/126201/mco-31209c-final.aspx

Ures, S. (2011). *Paying for military support in humanitarian assistance & disaster response: A cost analysis and planning model* (MBA report). Monterey, CA: Naval Postgraduate School.

THIS PAGE INTENTIONALLY LEFT BLANK

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL
555 DYER ROAD, INGERSOLL HALL
MONTEREY, CA 93943

www.acquisitionresearch.net