NPS-FM-11-013

ACQUISITION RESEARCH SPONSORED REPORT SERIES

Financing Naval Support for Humanitarian Assistance and Disaster Response: An Analysis of Cost Drivers and Cash Flows

24 May 2011

by

LCDR Stephen A. Ures, USN

Advisors: Dr. Aruna Apte, Assistant Professor, and

Dr. Keenan D. Yoho, Assistant Professor

Graduate School of Business and Public Policy

Naval Postgraduate School

Prepared for: Naval Postgraduate School, Monterey, California 93943

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

To request Defense Acquisition Research or to become a research sponsor, please contact:

NPS Acquisition Research Program
Attn: James B. Greene, RADM, USN, (Ret)
Acquisition Chair
Graduate School of Business and Public Policy
Naval Postgraduate School
555 Dyer Road, Room 332
Monterey, CA 93943-5103
Tel: (831) 656-2092
Fax: (831) 656-2253
e-mail: jbgreene@nps.edu

Copies of the Acquisition Sponsored Research Reports may be printed from our website www.acquisitionresearch.org.

ABSTRACT

The United States Department of Defense (DoD) does not budget for contingencies. The DoD does not set aside funds in the expectation of war, disaster, or other unexpected catastrophe, where obligation of those funds is contingent on the event actually occurring. This includes budgeting ahead for possible humanitarian assistance and disaster response (HA/DR) operations. Stability operations are now a core U.S. military mission, and HA/DR is one of six expanded core capabilities for the Navy, Marine Corps, and Coast Guard enumerated in *A Cooperative Strategy for 21st Century Seapower*. This represents a monumental strategic shift for an establishment traditionally defined by hard-power assets.

This thesis uses a disaster categorization method based on the size of the area affected and the speed of disaster onset and employs a multiple, flexible design case study method that analyzes incremental cost data from the responses to the 2004 Indian Ocean tsunami, the 2010 Haiti earthquake, and the 2010 Pakistan floods. Costs are analyzed for both their timing and the associated functional service provided and are presented in graphical format.

Despite the variety of HA/DR operations and the common belief that every disaster is different, this research identifies similarities in cost timing and function that exist across three of the four types of disaster. These findings provide insight into expected future demand and highlight the functions that represent the greatest leverage points for future optimization.

KEYWORDS: Humanitarian Assistance, Disaster Response, Disaster Relief, HA/DR, Stability Operations, Cooperative Strategy, Oslo Guidelines, Overseas Humanitarian Disaster Assistance and Civic Aid, OHDACA, USAID, DART, OFDA, DSCA, Tsunami, Earthquake, Flood, Indian Ocean, Ache, Indonesia, Haiti, Pakistan, Federal Budget, Financing, Fiscal, Fiscal Law, Incremental Costs, Differential Costs, Comptrollership, Operational Comptroller, Hospital Ship, Humanitarian Daily Rations

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

for my wife

THIS PAGE INTENTIONALLY LEFT BLANK

ABOUT THE AUTHOR

Stephen A. Ures, Lieutenant Commander Stephen "Pup" Ures is a naval aviator and fighter pilot with over 2,900 flight hours in the F/A-18 Hornet, F-14 Tomcat, T-45A, and T-34C. He has completed five combat deployments, logged 722 carrier landings, and flown over 400 combat flight hours supporting Operations Southern Watch, Enduring Freedom and Iraqi Freedom.

Afloat tours include service with the Black Aces of VFA-41, flying the F/A-18F, assigned as a Power Projection Strike Lead and Squadron Maintenance Officer, embarked aboard USS Nimitz from 2007 to 2009, as well as service with the Tomcatters of VF-31, flying the F-14D, assigned as a Forward Air Controller (Airborne), embarked aboard USS Abraham Lincoln from 1999 to 2003.

Ashore, Ures served as an instructor pilot and strike training manager with the Rough Raiders of VFA-125 in Lemoore, California, and as an Operational Test Director with the Evaluators of Air Test and Evaluation Squadron NINE Detachment, Point Mugu, California.

Ures is currently assigned to the Naval Postgraduate School in Monterey, California, where he is a Conrad Scholar, studying finance and working toward a Master of Business Administration. His thesis is titled Financing Naval Support for Humanitarian Assistance & Disaster Response: An Analysis of Cost Drivers and Cash Flows. His next assignment will be at the Naval Center for Cost Analysis, Washington, D.C.

Ures hails from Burbank, California, and is a 1996 graduate of the United States Naval Academy. He is authorized to wear the Air Medal with Combat V, the Strike Flight Air Medal, the Navy Commendation Medal with Combat V, the Navy Achievement Medal, and various campaign and unit awards. He is married to the former Catherine Walker of Palm Desert, California.

THIS PAGE INTENTIONALLY LEFT BLANK

NPS-FM-11-013

ACQUISITION RESEARCH SPONSORED REPORT SERIES

Financing Naval Support for Humanitarian Assistance and Disaster Response: An Analysis of Cost Drivers and Cash Flows

24 May 2011

by

LCDR Stephen A. Ures, USN

Advisors: Dr. Aruna Apte, Assistant Professor, and

Dr. Keenan D. Yoho, Assistant Professor

Graduate School of Business and 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 ACRONYMS AND ABBREVIATIONS

AMC	Air Mobility Command
AOR	Area of Responsibility
CENTCOM	Central Command
COCOM	Combatant Commander
COST	Contingency Operations Support Tool
CVN	Aircraft Carrier (Nuclear)
DART	Disaster Assistance Response Team
DLA	Defense Logistics Agency
DoD	Department of Defense
DoN	Department of the Navy
DoS	Department of State
DSCA	Defense Security Cooperation Agency
FMRs	Financial Management Regulations
FY	Fiscal Year
GAO	Government Accountability Office
HA/DR	Humanitarian Assistance and Disaster Response
IDA	Institute for Defense Analyses
NGO	Non-Governmental Organization
O&M	Operations & Maintenance
OFDA	Office of Foreign Disaster Assistance
OHDACA	Overseas Humanitarian, Disaster Assistance, and Civic Aid
OASN(FM&C)	Office of the Assistant Secretary of the Navy (Financial Management & Comptroller)
OSD	Office of the Secretary of Defense
OUSD(C)	Office of the Under Secretary of Defense (Comptroller)
PACOM	Pacific Command
SOUTHCOM	Southern Command
TEC	Tsunami Evaluation Coalition
USAID	United States Agency for International Development
USGS	U.S. Geological Survey

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

Concepts for the employment of military forces have expanded beyond the traditional paradigm of making war. Current policy states that "stability operations are a core U.S. military mission that the Department of Defense shall be prepared to conduct with proficiency equivalent to combat operations" (USD[P], 2009). Humanitarian Assistance and Disaster Response (HA/DR) is one of six expanded core capabilities for the Navy, Marine Corps, and Coast Guard enumerated in *A Cooperative Strategy for 21st Century Seapower* (DoN & USCG, 2007). This represents a monumental strategic shift for an establishment traditionally defined by *hard power* assets, recognizing that *soft power* effects may actually yield a strategically superior outcome. Because the DoD does not budget for contingency operations and because the nature of disasters, both natural and man-made, is unpredictable in occurrence and severity, the response to preserve life and alleviate suffering will be hastily formed. Since the legal authority to incur financial obligations and to conduct the actual HA/DR mission is not severable, a timely, well-documented, comprehensive, accurate, and credible cost estimate of the proposed military response is critical (GAO, 2009). However, it is not enough to limit the analysis to the incremental cost of the mission. As a steward of the public treasure, the operational comptroller has the fiduciary responsibility to appreciate and communicate the full financial burden of the operation to those decision-makers who will determine the scope of the military response and source the effort to individual units. For example, additional incremental operating costs caused by additional activities may lead to increased or accelerated maintenance costs at a later date. An analysis of the full cost will highlight the massive investment that enables the operation, much like a corporate treasurer would understand a company's weighted average cost of capital. As a result, sourcing decisions would reflect efficiency gains by sending units that provide the greatest utility at the lowest cost.

The United States Department of Defense (DoD) does not set aside funds in the expectation of war, disaster, or other unexpected catastrophe, where obligation of those funds is contingent upon the event actually occurring; this is to say that the DoD does not budget for contingency operations. Contingency operations include not only acts of war but also possible HA/DR operations. Despite their likely annual occurrence based on historic trends and the recent mass-mobilization efforts following major disasters around the globe, the DoD does not make an annual request for funds based on historic averages of past operations. While the current combat operations in Afghanistan and Iraq are called *Overseas Contingency Operations*, they are ongoing and therefore considered separately. Figure 1 depicts the growth in reported disasters since 1900; activity in the humanitarian space has substantially increased in the post–World War II era. While the mission of the United States military has grown to include stability operations, the incremental costs of those operations represent a small portion of the larger defense budget. However, the larger, additional costs of recruiting, training, and equipping for nondefense missions get buried. Without transparency, Congress does not consider those costs separately; force recapitalization and essential equipment upgrades risk being crowded out (Factor, 2011).

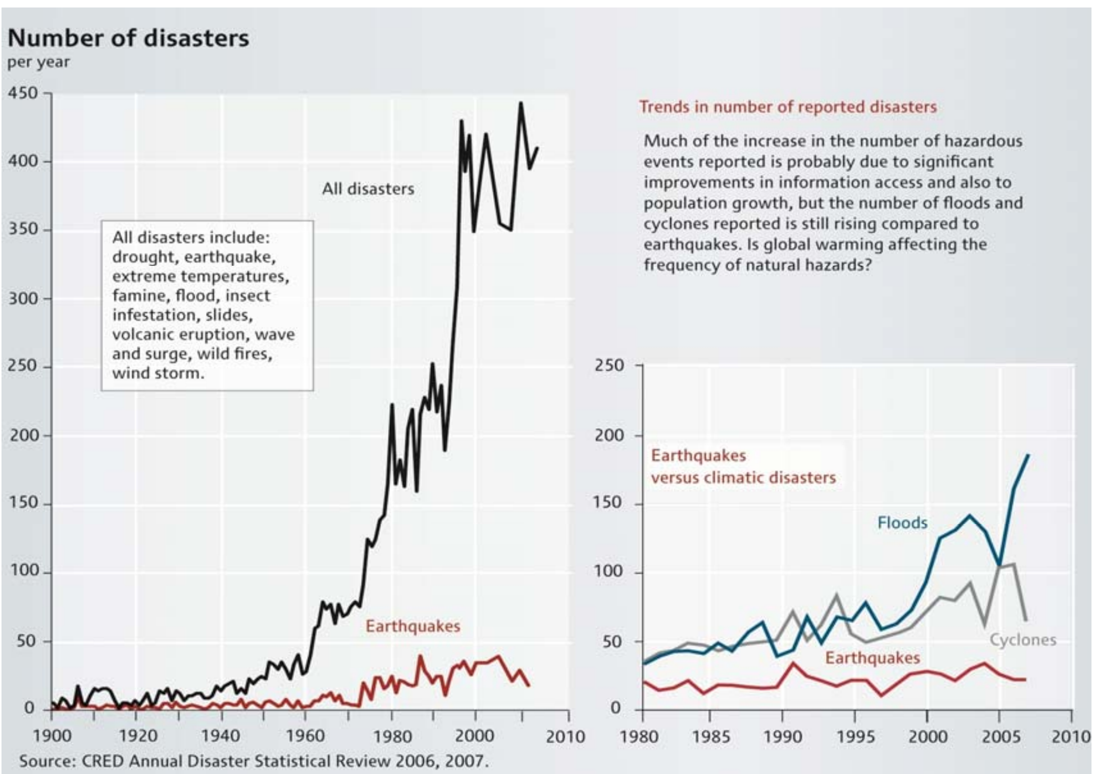

Figure 1. Number of Disasters per Year (1990–2007)
("Number of Disasters per Year," 2009)

Instead of setting aside funds prior to potential disasters, the DoD relies on a small, two-year appropriation within the Defense Security Cooperation Agency (DSCA) called Overseas Humanitarian, Disaster Assistance, and Civic Aid (OHDACA) to provide a small buffer of both funding and authority to begin an HA/DR mission in response to a major disaster. The typical amount of the appropriation for this purpose is $20 million (DoD, 2006), barely enough to fund the deployment of a single hospital ship. The remainder of the funds must come from reprogramming, transfers, or supplemental appropriations (Rogers, 2011). A timely, if not accurate, cost estimate for an expected HA/DR mission is critical to this funding process.

I use a classification method put forth by Apte (2009) that describes disasters in two variables: their speed of onset and the size of the affected area. As classification moves from slow to sudden onset, and from a localized to a dispersed area, the difficulty of the response increases. Figure 2 explains this system in a convenient format.

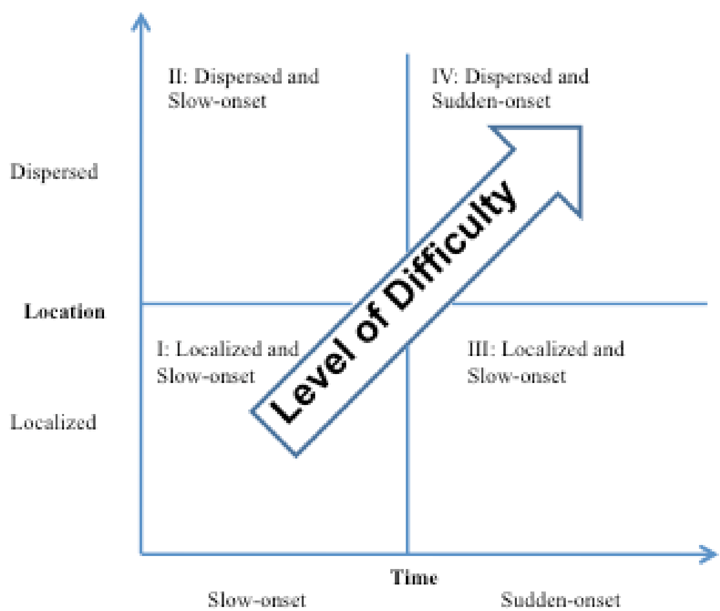

Figure 2. Disaster Classification and Difficulty of Response
(Apte, 2009)

In order to increase the accuracy of the cost estimates associated with HA/DR missions, it is necessary to understand the specific cost drivers associated with these types of missions. A U.S. Navy library of lessons learned for HA/DR operations that include expenditures that are identified by the type of expense incurred (such as fuel, personnel, and helicopter operations) and the date on which they were incurred could not be identified. This research investigates three HA/DR missions completed by the U.S. Navy from the standpoint of funding, with special attention paid to the types and timing of expenditures.

A. THREE DIFFERENT DISASTER CASES

In order to understand the operational drivers of the costs associated with HA/DR missions, I explore three very different disasters and the U.S. Navy's response to each. The disaster types investigated may be classified broadly with respect to the speed of their onset and the geographical dispersion of their impact, as described by Apte (2009). The first disaster I discuss is the dispersed, sudden-onset tsunami of 2004 off the coast of Sumatra. The second is the localized, sudden-onset earthquake in Haiti in 2010. Finally, I discuss the dispersed, slow-onset floods in Pakistan in 2010.

1. Tsunami 2004: Dispersed, Sudden-Onset Disaster

At 7:58 a.m. local time on December 26, 2004, a massive undersea earthquake occurred off the west coast of northern Sumatra. A magnitude of 9.1, the second largest in recorded history as reported by the U.S. Geological Survey (USGS), the earthquake caused the height of the sea floor to elevate as much as 16 m over a distance of 1,200 km. The huge volume of displaced water resulted in a series of tsunamis that radiated outward at over 500 km/h. The waves started small in deep waters. As the depth of the water shallowed and the waves slowed, they grew in height to as much as 20 m at landfall in Ache, Indonesia, and reached 3 km inland at other locations (Telford, Cosgrave, & Houghton, 2006).

The disaster spread throughout the Indian Ocean, causing deaths in 14 countries. Indonesia, Sri Lanka, India, and Thailand were the hardest hit in terms of people lost and missing; however, fatalities were reported as far away as South Africa. In total, 227,898 people were lost (died or missing) and over 1.1 million were displaced (United States Agency for International Development [USAID], 2005). To make matters worse, infrastructure in many locations ceased to exist—surrounding the town of Ache, on the island of Sumatra, roads and other critical infrastructure were washed away.

Once the world recognized the extent of the destruction and magnitude of the human tragedy, an international relief, recovery, and reconstruction effort began that would eventually grow to a cost of $13.5 billion. The United States Government alone pledged $350 million (USAID, 2005). Much of the aid came in the form of logistical services. Some areas, such as Ache, could be reached only by helicopter, and only the military possessed the kind of helicopter lift capacity required on the scale necessary to meet the need (Telford et al., 2006).

On January 2, 2004, seven days after the earthquake, the aircraft carrier USS *Abraham Lincoln* (CVN 72), conducting a port visit in Hong Kong when the disaster struck, arrived off the coast of northern Sumatra with 17 embarked helicopters (Elleman, 2007). The amphibious ship USS *Bonhomme Richard* (LHD 6), with an embarked Marine Expeditionary Group and 25 helicopters, arrived five days later. The eventual U.S. military commitment included 25 Navy ships, one Coast Guard cutter, 82 planes, 51 helicopters, and 15,000 personnel (Elleman, 2007). The focus of the Navy relief effort was split between northern Sumatra and Sri Lanka in what became known as Operation Unified Assistance. The naval vessels operated as a sea base for relief efforts for 40 days. They departed the region on February 10, relieved by the hospital ship USNS *Mercy* (T-AH 19) and supported by helicopters from USS *Essex* (LHD 2). *Mercy* was activated and had sailed from San Diego on January 8 to provide sea-based hospital services for 34 days, departing the area on March 16.

2. Haiti Earthquake 2010: Localized, Sudden-Onset Disaster

At 4:53 p.m. local time on January 12, 2010, a magnitude 7.0 earthquake struck southern Haiti from an epicenter 10 miles southwest of the capital city, Port-au-Prince (USGS, 2010). The resulting human and economic impact made this the worst natural disaster to strike the western hemisphere in recorded history (Department of State [DoS], 2010). The United Nations estimated that approximately three million people, roughly 10% of Haiti's population, were affected by the disaster. The death toll, initially predicted to be 100,000, numbered 230,000 after one month. Six months later, over two million displaced persons remained in Haiti (USAID, 2010c). The World Bank estimated economic losses at $7.8 billion (DoS & USAID, 2010).

The earthquake was unique not only because of the magnitude of the geological event but also because of the scale of human loss, the proximity to the capital, and the loss of governmental function. The epicenter of the earthquake was just 25 km (or approximately 16 miles) from Port-au-Prince, the country's capital and largest city, which is characterized by underdevelopment and congestion. The shaking toppled 28 of the 29 government ministry buildings in the capital, killing 17% of the country's civil service and destroying decades of administrative records that included land and civil registries, voter rolls, payrolls, tax maps and records, court records, and financial management systems (DoS, 2010). The confluence of human and economic loss, destruction of infrastructure, and decimation of the national government created the need for massive international assistance.

The aid package provided by the United States Government in fiscal year (FY) 2010 totaled $1.12 billion. Over $453.5 million of the total funding represented the incremental cost to the DoD. Within days of the earthquake, the U.S. Navy had 20 ships on station or en route, including one aircraft carrier, one hospital ship, and seven amphibious ships. Embarked units on the ships included Marine Corps, construction engineering, explosive ordnance disposal, mobile diving and salvage, underwater construction, medical, civil affairs, and others. The commitment of ship- and land-based aircraft was equally massive. Surveillance aircraft surveyed the damage, fixed-wing planes serviced inbound cargo needs and outbound evacuations, and helicopters provided the vertical lift capacity critical to operating in an area without functioning infrastructure. The U.S. Navy and Marine Corps committed a combined number of 14 fixed-wing aircraft and 63 helicopters.

3. Pakistan Floods 2010: Dispersed, Slow-Onset Disaster

On July 22, 2010, rain started falling in Pakistan. Heavy flooding began a week later. By the end of August, 61,776 square miles of Pakistan were flooded; 1,248,704 homes were damaged or destroyed; and 20 million people were directly affected. Additionally, 402 Pakistani health facilities were damaged or destroyed, as were 13,900 square miles of cropland (DoS, 2010). Much of the nation's roads and highways remained submerged for months, and numerous bridges were washed away. Despite its characterization as a slow-onset disaster, the flooding was dispersed over 82 of Pakistan's 122 districts and damaged both infrastructure and key resources. The international community responded, and U.S. Government aid provided by the DoS in the ongoing disaster response amounted to $595 million as of January 21, 2011 (USAID, 2011a).

Each of these disasters had unique features that contributed to its scale and scope of destruction, its geographic dispersion, and its speed of onset. The Navy's operational response to each disaster had unique features as well and generated differences in obligations and expenditures. Before discussing the details of the expenditures associated with each of the responses to these disasters, it is first necessary to explain the process by which the DoD funds HA/DR missions.

B. FROM DISASTER TO MILITARY COMMITMENT

Before the United States will commit to a formal disaster relief operation, U.S. law requires a diplomatic cable from the ambassador to the affected nation that certifies the meeting of three criteria: the disaster must be beyond the ability of the host nation to handle on its own, the host nation must formally request U.S. assistance, and the assistance must be in the strategic interests of the United States (Perry & Travayiakis, 2008). This action creates the bona fide need for assistance, which allows the USAID Office of Foreign Disaster Assistance (OFDA) to immediately provide the ambassador with $50,000, with the option to increase the amount to $100,000. Additionally, the regional U.S. military combatant commander (COCOM) can authorize the immediate response of DoD units deployed in the area, called *life and limb authority*, limited to 72 hours (DSCA, 2011). Receiving full-scale military support beyond 72 hours requires a formal request from the Secretary of State to the Secretary of Defense (Perry & Travayiakis, 2008).

This formal request of full-scale military support satisfies two important requirements. The first deals with the moral question of involving military forces in a humanitarian operation. In order to limit the perception of a hidden military agenda, U.S. policy closely mirrors the Oslo Guidelines on the Use of Foreign Military and Civil Defense Assets in Disaster Relief, allowing support of civilian relief agencies only if the response capacity of the host nation and international community is overwhelmed, all other commercial options have been exhausted, and there exists no comparable civilian alternative to the use of military and civil defense assets (Perry & Travayiakis, 2008). The second requirement deals with authorizing and funding the sustained military effort.

The USAID, an agency of the DoS, assumes the role of lead federal agency in the U.S. Government response to a request for humanitarian assistance or disaster relief. Within USAID, the OFDA deploys a disaster assistance response team (DART) to the region to assess needs and coordinate assistance. The USAID maintains standing contracts with private firms facilitating the charter of fixed and rotary-wing aircraft that can be used to provide lift support and ship supplies and to conduct search and rescue operations (Perry & Travayiakis, 2008). In fact, USAID generally prefers commercial air services to military. In responding to minor emergencies, shipping by FedEx is less costly than using any assets of the Air Mobility Command (AMC). This provides a compelling argument for sourcing transport services commercially, except under the most extreme circumstances, when massive capacity is required (Perry & Travayiakis, 2008).

C. MILITARY COMMITMENT

The responsibility for the whole of U.S. military operations within a particular region of the globe lies with the COCOM. The COCOM's authority may be accorded geographically by area of responsibility (AOR) or may transcend geographic boundaries into operational functions. When the DoD responds to a disaster, the COCOM with cognizant authority for that area will oversee the military response (Halvorsen, Caldwell, & Gurwith, 2011). Each of the three selected disaster cases addressed in this study occurred in a different COCOM AOR. The Indian Ocean tsunami in 2004, although widely dispersed over thousands of miles, created the need for U.S. military assistance in the Pacific Command (PACOM) AOR. Additionally, the 2010 earthquake in Haiti was confined to the Southern Command (SOUTHCOM) AOR, and the 2010 dispersed, slow-onset flooding in Pakistan occurred in the Central Command (CENTCOM) AOR.

The rapidity of military response is occasionally driven by the personal relationship between the ambassador to the stricken country and the COCOM himself but is more generally a function of the assertiveness known colloquially as “leaning forward” (Rogers, 2011). Once a disaster event occurs, and appears to meet the criteria for military assistance, the COCOM begins pushing assets (ships, aircraft, personnel, and supplies) toward the affected region. In extreme cases, when the enormity of the disaster is obvious, the COCOM can authorize military forces to conduct HA/DR in the host nation’s territory to preserve life and prevent suffering for no more than 72 hours (Halvorsen et al., 2011). Back in Washington DC, planning for a more sustained response begins as the Joint Staff makes an initial estimate of the incremental cost of the military response. Concurrently, the DoS, USAID, DoD, DSCA, Joint Staff, and COCOM collaborate as to the type, scale, and potential duration of the DoD response. This phase of the rapid planning process determines the cost drivers of the operation. Next, the Office of the Under Secretary of Defense (Comptroller; OUSD[C]), the Financial Management & Comptroller organizations of the individual Services that will participate in the response, and the DSCA collaborate to provide a more detailed cost estimate. Their primary tool for this purpose is the Contingency Operations Support Tool (COST), which was created and is maintained by the Institute for Defense Analyses (IDA).

Once the Secretary of State formally transmits to the Secretary of Defense the request for military assistance and the Secretary of Defense agrees that DoD support is necessary, appropriate, and feasible, the Office of the Secretary of Defense (OSD) crafts a letter that authorizes the sustained response. The Secretary of Defense may deploy additional assets (e.g., ships, units, aircraft, personnel, equipment), and supporting commanders who control those additional assets can now change their operational control to the COCOM, who becomes the supported commander. More importantly, the authorization letter provides a top-line dollar value that bounds the upper limit of incremental spending and determines the scope of military support. This number is critical because it relates directly to the appropriation of OHDACA, which provides the legal framework under which the military response is both financed and authorized.

D. OHDACA: BOTH THE FINANCING AND THE AUTHORIZATION

The OHDACA appropriation falls under the DSCA. Budget authority not associated with any particular Service, OHDACA funds are tucked in among the Operations & Maintenance (O&M) appropriations that fund defense-wide operations, with a notable difference. Whereas a standard O&M appropriation grants authority to incur financial obligations for one year, OHDACA typically lasts two years. The OHDACA appropriation for FY2008 was unique in that its obligation period was three years (Halvorsen et al., 2011). The multi-year nature of this particular O&M appropriation allows an additional measure of flexibility.

According to the DoD budget justification for FY2012, the OHDACA appropriation supports the Secretary of Defense and COCOMs in their efforts to improve international security cooperation and foster relationships with allies, friends, civil society, and potential partners (DoD, 2011). OHDACA has three component programs: *Humanitarian Assistance* provides for building long-term relationships, *Humanitarian Mine Action* provides training and assistance with land mine abatement, and *Foreign Disaster Relief* provides funding to respond to severe natural and man-made disasters (DSCA, 2011). The typical annual base budget request under Foreign Disaster Relief has been $20 million, raised to $30 million in the FY2012 budget request (DoD, 2011). This provides a small amount of readily available budget authority, allowing the Secretary of Defense and the COCOM to initiate a rapid DoD response to a crisis. Typical DoD responses involve logistics and transportation, the provisioning of humanitarian daily rations, search and rescue, medical support and evacuations, and basic supplies and services to internally displaced persons (DSCA, 2011). Humanitarian Daily Rations are specially designed to feed large groups of malnourished displaced persons or refugees. The rations are thermostabilized, packaged to survive airdrops, and designed for a variety of potential consumers with diverse religious and dietary restrictions (Defense Logistics

Agency [DLA], 2011). Special *halal* meals were provided in response to the floods in Pakistan in 2010 (Rogers, 2011).

However, as was the case in the three disasters discussed in this thesis, massive disasters where the need for military assistance appears obvious at the outset rapidly deplete the budget authority contained in OHDACA Foreign Disaster Relief. The only known options to obtain funding are through reprogramming, transfer, or supplemental appropriation. While not critical from a conventional cash flow standpoint, the military units actually performing HA/DR incur obligations under their own O&M accounts that are later reimbursed by OHDACA (Rogers, 2011). The existence of budget authority within OHDACA actually provides the inherent legal authorization to conduct the mission. Both the funding and the authorization for the DoD to conduct HA/DR flows from OHDACA; the two cannot be de-linked (Rogers, 2011).

E. THE OPERATIONAL COMPTROLLER'S ROLE IN MANAGING HA/DR FINANCES

In his piece *Joint Operational Warfare*, Vego (2007) lists six operational functions: Command Organization, Command & Control, Intelligence, Fires, Logistics, and Force Protection. Each operational function of warfare has an analog that exists in private industry. However, private industry has a seventh function that is not represented by a military analog in Vego's (2007) list. That function is financing, and it would be performed by the Operational Comptroller (J. Czarnecki, personal communication, February 8, 2011). With capital already provided, short-term investments become questions of resource management. In that sense, the operational comptroller provides an integrative function that touches each of the other six functions (J. Czarnecki, personal communication, February 8, 2011). In the performance of HA/DR, the operational comptroller serves at least three masters: the COCOM who oversees the operation, the supporting commanders who provide resources for the operation, and the comptrollers at higher headquarters who ensure that sufficient funding (and, therefore, authority) is available.

In relatively simple terms, the operational comptroller must manage and communicate cost concepts. Some concepts are specific to government operations and derived from fiscal law while others are universal in nature and applicable in any financial concern, public or private (Garrison, Noreen, & Brewer, 2010). Relevant cost concepts include the following:

- Fixed Cost—A cost that remains constant within a defined range of activity.
- Variable Cost—A cost that changes in direct proportion to the level of activity.
- Sunk Cost—A cost that has already been incurred. It cannot be changed by any present or future decision. Investment costs (research, development, test, and procurement) in ships and aircraft are not relevant to decisions regarding current or future operations.
- Opportunity Cost—The potential benefit that is given up by selecting one alternative over another. This type of cost does not flow to an income statement but is of primary concern to corporate treasurers when making investment decisions. In any military operation, including HA/DR, these decisions resemble resource management rather than financing.
- Incremental Cost—A differential cost, referring only to the increase in cost caused by selecting one alternative over another. Incremental cost is a key term for a DoD comptroller. A cost item that is already funded in the base budget—such as salaries for personnel, planned flight hours for helicopters, or expected steaming days for ships—is not considered when deciding to commit to an HA/DR mission. Only the additional, incremental cost is considered and subsequently reimbursed to the Services under OHDACA.

The DoD uses the Contingency Operations Support Tool (COST) to create a rapid and detailed cost estimate of a contingency operation, which then determines the size of the funding request for OHDACA. However, an efficient contingency funding plan for HA/DR requires quick and effective cost estimation, and a successful response to a disaster event must be both sufficient and economical. This thesis explores the costs associated with three HA/DR operations in order to determine the following:

- Is it possible to disaggregate end-item costs and identify the major cost drivers for HA/DR operations?
- Is there utility to an operational comptroller fusing the disparate and materially different cost information that is required among the various functions of the DoD to create a better cost estimate?

II. METHODOLOGY

As stated previously, I use a multiple, flexible-design, case-study method to answer the research questions. I selected three cases. Each case illustrates a response to a natural disaster in which the U.S. Navy played a major or central role. Each case represents a different type of disaster, and each disaster occurred in a different COCOM AOR. The case-study disasters and subsequent HA/DR missions are the following:

- The 2004 Indian Ocean tsunami. This was a dispersed, sudden-onset disaster that occurred in the PACOM AOR, caused the loss of 227,898 people, and displaced over one million people. The Navy's incremental cost was $63.8 million (adjusted for inflation to 2010 constant dollars).
- The 2010 Haiti earthquake. This was a localized, sudden-onset disaster that occurred in the SOUTHCOM AOR, killed over 230,000 people, displaced over three million people, and resulted in $7.8 billion in economic loss. The Navy's incremental cost was $155.1 million.
- The 2010 Pakistan floods. This was a dispersed, slow-onset disaster that occurred in the CENTCOM AOR, damaged or destroyed 1,248,704 homes and 13,900 square miles of cropland, and directly affected over 20 million people. The Navy's incremental cost was $22.2 million.

I have found no centralized database within the DoD or U.S. Navy that is maintained to track historical expenditures associated with HA/DR missions for the purpose of analysis and continuous improvement. The financial analysis of the HA/DR operations in this thesis utilized original source data provided by the Office of the Assistant Secretary of the Navy (Financial Management & Comptroller; OASN[FM&C]). Data were provided in the form of original documents, such as memorandums and internal working documents, spreadsheets, and internal briefing slides. Costs are reported as the obligations are incurred. Dollar amounts of obligations are recorded in *then year* dollars. To normalize the data, the Joint Inflation Calculator (Naval Center for Cost Analysis [NCCA], 2011) was used to escalate all dollar amounts to FY2010 dollars.

The preferred source of cost data was the actual obligation statements. Utilizing the indirect method for generating a statement of cash flow, the incremental change of each budgetary account was derived for each week following the disaster event. When actual expense timing could not be derived due to lack of data, planning data were used to derive estimated and probable expense timing. Actual budget submissions were used as a last resort to fill in the gaps. Expense timing data are analyzed and presented in a time-series, graphical format for ease of discussion.

Additionally, total expenses were disaggregated and separated according to the functional service provided. The cutoff week for the purpose of analysis is stated for each case. Cost items were disaggregated according to cost breakdown structure codes and budget activity codes. Briefings provided by OASN(FM&C) were used to assist in the collection of costs in the proper pools, when required.

III. REVIEW OF LITERATURE

Joint Publication 3-29, titled *Foreign Disaster Assistance* and issued by the Office of the Chairman of the Joint Chiefs of Staff (OCJCS, 2009), provides the latest doctrine applicable to U.S. military forces. It discusses the operational, planning, and legal framework of military support for HA/DR, explains OHDACA, and provides some basic explanations of applicable fiscal law and required financial tasks.

The *DoD Financial Management Regulations* (*FMRs*; Under Secretary of Defense [Comptroller; USD(C)], 2007) promulgates financial policy and procedures for military contingency operations. This document provides detailed instructions for incurring obligations and reimbursing for services provided in contingencies that do not involve wartime activities or that are in support of domestic peacetime civil emergencies. Only the incremental cost incurred in direct support of the contingency operation is eligible for reimbursement.

The COST was created and is currently hosted by the IDA. It is a multi-user cost-estimating tool that models the incremental cost of deployment in four main categories: personnel, personnel support, operations support, and transportation. It does not model procurement, munitions, military construction, force recapitalization or reset, working capital funds, security agreements for coalition support, counter-improvised explosive device/counter-drug operations, or force protection. The tool uses an engineering build-up approach to estimate the incremental cost of five phases of a contingency operation, from pre-deployment to reconstitution. Data are provided by Service-specific sources (IDA, 2011). A recent report issued by the Government Accountability Office (2008) recommended that the DoD conduct an independent review to ensure that the COST model adheres to best practices and to consider refining the model to better meet the needs of the individual Services.

Existing literature includes published works about various disaster events that describe military support of HA/DR from a civil-military, operational, and logistics viewpoint. There are also numerous DoD publications, regulations, directives, and instructions that address both the ideal operational decision and financial management processes. However, to date, no published work could be found that evaluates the cost estimation and financial aspects of military support for HA/DR, identifies the timing of the activities associated with the major cost drivers, or attempts to apply market indices as a proxy for estimating the cost of those activities.

IV. CASE STUDIES AND ANALYSIS

A. THE 2004 INDIAN OCEAN TSUNAMI

A body of literature exists regarding the operational, planning, and whole of government response to the 2004 Indian Ocean tsunami. Therefore, this particular case lends itself to more than just financial analysis. The case is introduced with historical evaluations of the HA/DR mission from different points of view. It provides a useful context for understanding HA/DR, aspects where the military adds value, and opportunities for improvement. The financial analysis that follows gives insight into the operational comptroller's role as a resource manager.

1. Operational Evaluation and Strategy Development

In his publication *Waves of Hope: The U.S. Navy's Response to the Tsunami in Northern Indonesia,* Professor Bruce Elleman (2007) presents a chronology of the disaster and a history of the U.S. Navy's response. The book highlights the Navy's flexibility and emphasizes its value in achieving national security objectives.

Elleman assembled fragments of data, hundreds of press accounts, and dozens of interviews with decision-makers and participants in Operation Unified Assistance to create his report. The underlying purpose of the report was to demonstrate the importance of the ability to "sea base" forces. The tsunami disaster provided the ideal framework in which to showcase this capability. The disaster originated from the sea, impacted coastal regions, and devastated sufficient infrastructure to completely isolate affected areas. Using the framework of an operational evaluation, Elleman (2007) endeavored to develop the strategy and validate as a core competence this unique capability of the U.S. Navy.

The method used in this piece is a part-task assessment with an overarching chronological theme. The considerable effort spent detailing the geological and environmental facts of the disaster highlighted its sudden onset. A sudden-onset disaster requires not only a rapid response but also one of exceptionally larger scale when compared to a slow-onset disaster. Civilian aid organizations, which rely on contracted logistics services, lack the ability to generate the necessary spike in capacity to respond immediately (Telford et al., 2006).

Conversely, the U.S. Navy had assets already deployed in the Western Pacific. The aircraft carrier *Abraham Lincoln* and the amphibious ship *Bonhomme Richard*, both capital ships with several smaller warships in company, represented the excess capacity that could provide the most immediate response. At the time, neither ship was conducting combat operations but was providing U.S. presence in the region. Using his life and limb authority, before President Bush had announced America's commitment of $350 million (FY2005, *then year* dollars) to the disaster response, Admiral Thomas Fargo, commander of the U.S. PACOM, had already ordered both ships redeployed to the affected region (Elleman, 2007). This level of flexibility and rapidity of response had normally been associated with the U.S. Navy, historically providing leaders with hard power tools of diplomacy not enjoyed by other nations. This time, hard power assets would be used to provide soft power effects (Elleman, 2007).

The region around Ache, on the northern part of the Indonesian island of Sumatra, was the focus of the U.S. Navy's efforts. The tsunami had eliminated the coastal road, cutting off over 110 miles of coast from supply by land. This highlighted the value of helicopter vertical lift to the success of the humanitarian mission (Elleman, 2007). During the 40 days they were on-station, helicopters from the Abraham Lincoln Strike Group alone flew 1,800 sorties, delivered 2,700 tons of food, water, and medicine, and evacuated 3,000 people (Elleman, 2007).

The other important characteristic of the U.S. response package was the ability to base aid assets at sea. In a region dominated by Muslims, the scene of an active domestic insurgency, sea basing of American forces proved culturally sensitive and politically flexible (Elleman, 2007). This unique capability limited the American footprint ashore, reducing friction with the local government and mitigating U.S. concerns about force protection. This also improved the efficiency of the logistics effort, since greater numbers of aid personnel working ashore add to the supply burden. Furthermore, the first U.S. Air Force C-17 did not land at the Banda Ache airport until January 11, 2005, carrying over 18,000 pounds of rice, 22,000 pounds of water, a pickup truck, and floodlights for the airport itself. *Abraham Lincoln* had already been on station for nine days.

The hospital ship *Mercy* relieved the *Abraham Lincoln* and provided services for 34 days. The ship became an important symbol of how the United States could help countries in distress. Fargo thought of *Mercy* not only as a medical asset but also as an opportunity to reengage Indonesia politically. The ship would not only provide emergency care but also help guard against epidemics by reconstituting the indigenous medical infrastructure. However, since the ship arrived several weeks after the tsunami, very little of the ship's huge medical capacity was actually used and there were few acute medical cases to treat. Instead, *Mercy* treated non-acute cases, such as chronic diseases and head and neck tumors (Elleman, 2007).

Elleman's operational evaluation makes a compelling case for the strategy. This disaster provided the ideal conditions to highlight the value of the U.S. Navy's capacity for helicopter vertical lift and sea basing of assets. He makes brief mention of the costs, but they are unspecific, reported by a Pentagon public affairs officer as about $6 million per day (Elleman, 2007). Fargo stated, "You have already paid for the fixed costs, like the fuel for the nuclear reactor. … Nobody sat around thinking that we will do this if there is a supplemental" (Elleman, 2007). One failure noted in Elleman's evaluation of the mission was the Navy's inability to communicate on a grand scale in the unclassified arena. The ships functioning as sea bases were equipped to communicate under normal circumstances at the secret level. Since the international aid response included numerous actors, such as various military Services, civilian aid agencies, and non-governmental organizations (NGOs), communication had to be unclassified. This hindered the U.S. Navy's ability to effectively coordinate. Furthermore, while sea bases possessed advanced technology data links that allowed communication with units thousands of miles away, they lacked the ability to communicate with personnel working ashore only three miles away. In one case, the U.S. Marine Corps provided handheld radios that would allow beach personnel to talk to the aircraft carrier off the coast (Elleman, 2007).

Costs incurred because of the lost efficiencies in these cases were not captured scientifically and indeed only provided anecdotally (Elleman, 2007).

2. The Integrated Response

The Tsunami Evaluation Coalition (TEC) issued the *Joint Evaluation of the International Response to the Indian Ocean Tsunami: Synthesis Report*, by John Telford and John Cosgrave (2006). The evaluation was a comprehensive report that used a chronological accounting of the disaster and global response to bring out learning points that would improve future HA/DR operations. The evaluation did not merely focus on USAID or the U.S. military's contributions but also looked at the whole of the response, beginning with the effects of the press on rallying public support. It went on to include myriad examples of inefficiencies borne out of the best intentions and to balance the need for logistical capacity with the expense of military participation (Telford et al., 2006).

Coverage in the Western press was not balanced. Forty percent of articles that dealt with the impact on people focused on Western tourists, and this group made up about 1% of the casualties. This media attention contributed to the "second tsunami," as hundreds of aid agencies and militaries descended on the region and contributed to making the disaster the most generous and immediately funded international humanitarian response in history, totaling $13.5 billion (Telford et al., 2006).

Poor information management and limitations on prior planning resulted in inappropriate aid. Some items included expired pharmaceuticals, Viagra, and ski jackets. Tinned pork was sent to Ache, a predominantly Muslim region whose inhabitants will not eat swine. Expired food was sent throughout the area. These items were not only worthless to the recipients but actually provided negative value by utilizing transportation capacity, occupying storage space, and requiring the additional burden of sorting and disposal. The failure to adequately utilize the distribution and transportation capacity for appropriate, unexpired food contributed to other logistics failures like choked airports and warehouses, blocked seaports, abandoned piles of clothing, and expensive materials left to deteriorate in the sun and rain (Telford et al., 2006).

Military support for HA/DR is expensive and typically costs four to eight times that of similar commercial services (Telford et al., 2006). Nevertheless, no other organization can currently deliver a comparable critical mass of resources in as short a time. The international humanitarian system has very little standby capacity, even with contractor support (Perry & Travayiakis, 2008). Until civilian aid organizations improve their emergency surge capacity, the military will continue to play an important role as the only source of large amounts of rapidly deployable helicopter lift. Given the inevitability of the military's role in the next major disaster, and the cost of the services it provides, this presents two compelling reasons to improve training and coordination for this mission.

3. Financial Analysis

Despite the magnitude of this disaster and the evaluative reports it has engendered, there is a relative scarcity of original-source financial statements memorializing the Navy's participation in the response. However, I derived an estimated time-series of cash flows from various memos and presentations and present the information in Figures 3 and 4. All amounts have been escalated to FY2010 dollars. Both figures depict the expectation of an immediate obligation of funds, which stabilize for about seven weeks and then rapidly decline. This pattern was not unexpected given the dispersed, sudden-onset nature of the tsunami, which required civilian aid organizations to rely on the massive, ready capacity provided by the military until their own commercially sourced logistics systems were in place. This spike emphasizes the need for the operational comptroller to quickly respond to sudden and unexpected demand.

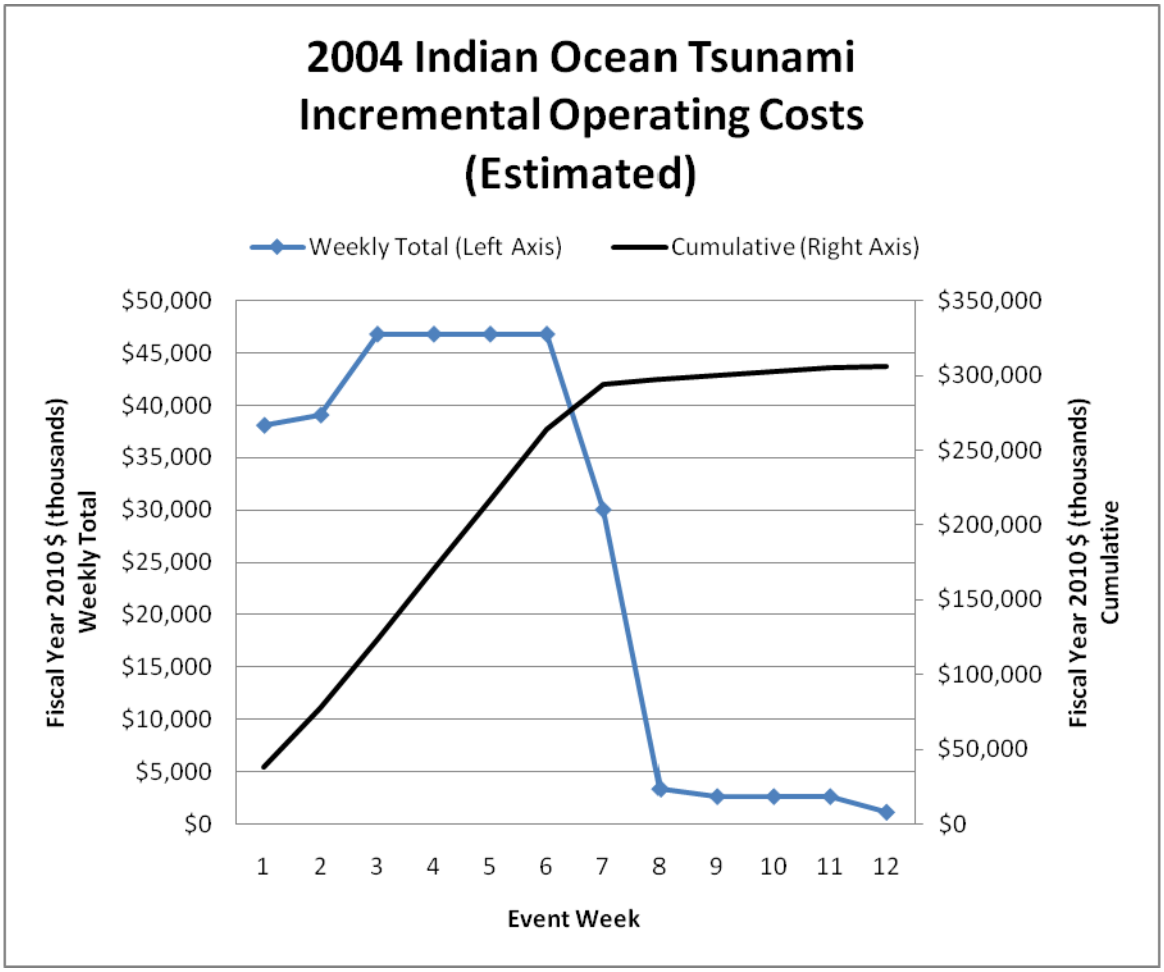

Figure 3. 2004 Indian Ocean Tsunami Incremental Operating Costs (Estimated)

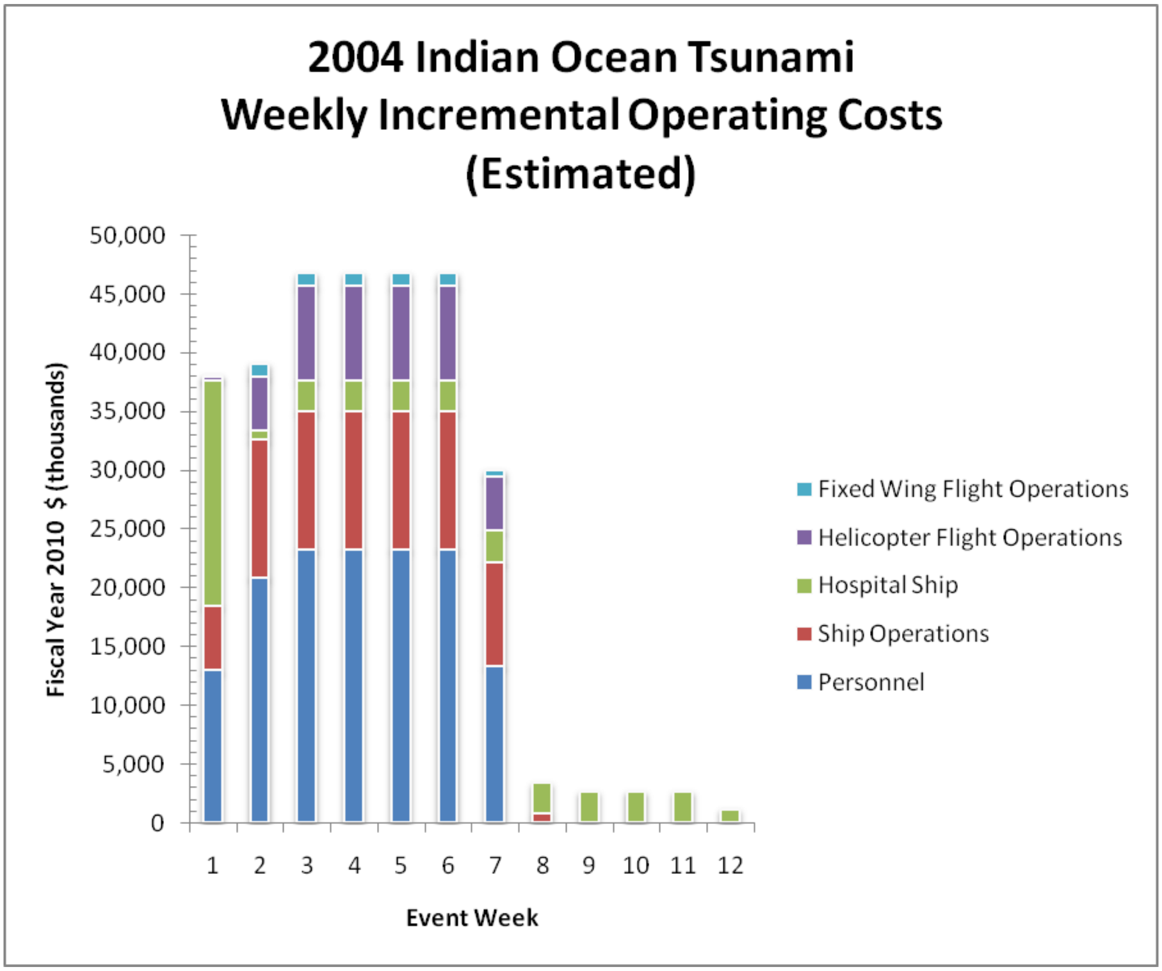

Figure 4. 2004 Indian Ocean Tsunami Weekly Incremental Operating Costs (Estimated)

Figure 5 breaks that original source derivation down into individual functions. Personnel costs were forecast to represent the greatest percentage of expenditures, at nearly 50%, while both the hospital ship and helicopter flight operations each represented 14%. On a variable activity basis with complete disaggregation of the costs of all functions, this might be the case. However, on an incremental cost basis, the personnel item shrinks as a share of total cost, because most personnel would get paid regardless of the level of HA/DR activity. The conditions that would elevate the personnel cost would include mobilization of reserve forces, extra pay associated with an unscheduled ship deployment (such as family separation allowance), personnel travel, or hostile fire/imminent danger pay. Those personnel who went ashore in Indonesia would have been entitled to imminent danger pay, so minimizing the Navy's footprint through sea basing yielded some cost savings.

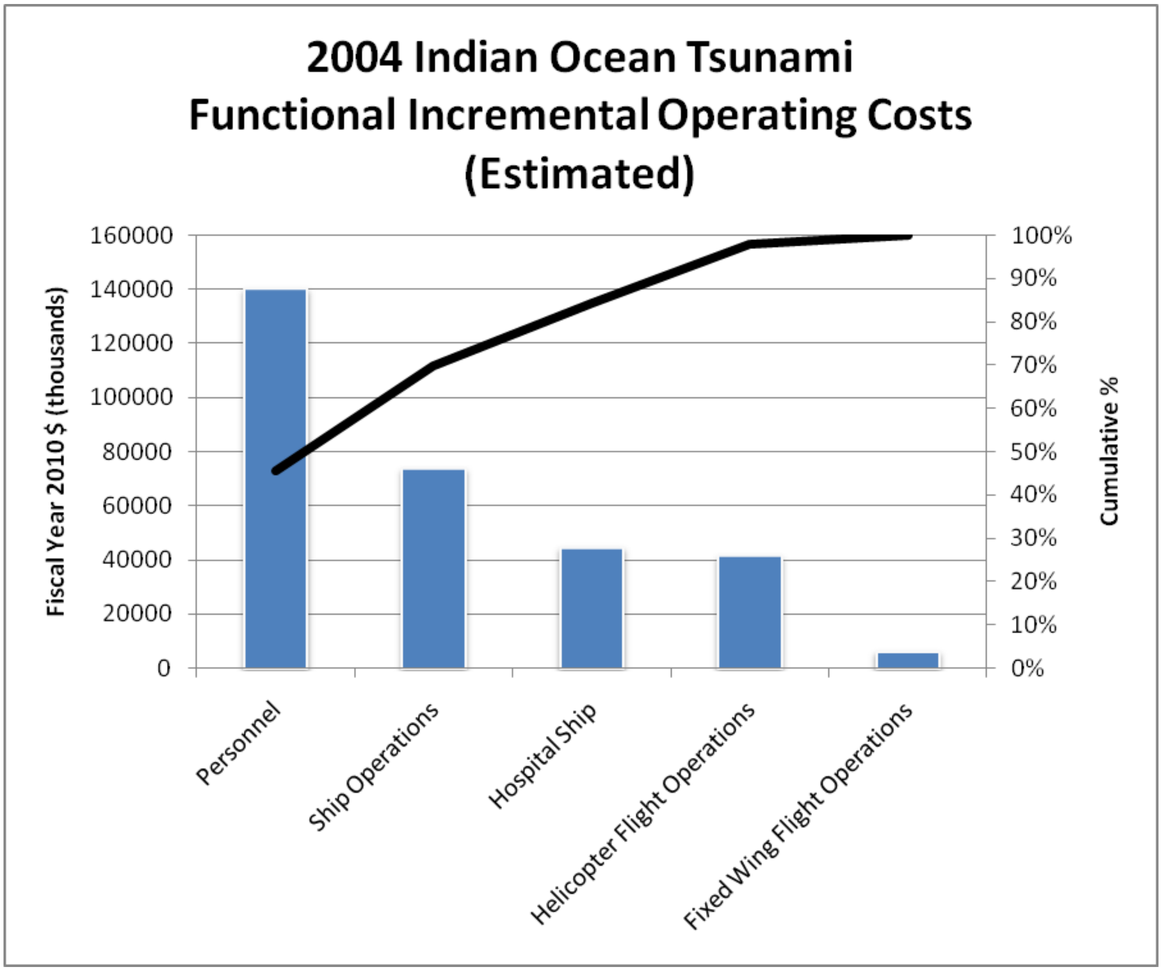

Figure 5. 2004 Indian Ocean Tsunami Functional Incremental Operating Costs (Estimated)

The only original source financial statement available to the researcher was the final expense statement. This data is presented in Figure 6, which depicts the Navy's incremental costs as reported at the conclusion of the operation. The actual reported costs differ significantly from the forecasted estimate provided by OASN(FM&C) and presented in Figure 5, with flight operations consuming 44% of total incremental obligations. Costs associated with the deployment of a hospital ship (*Mercy*) represent the next largest expense item, at 23% of total. Ship operations consume an additional

11% of total incremental costs. These three items together comprised 78% of the Navy's incremental costs of the response.

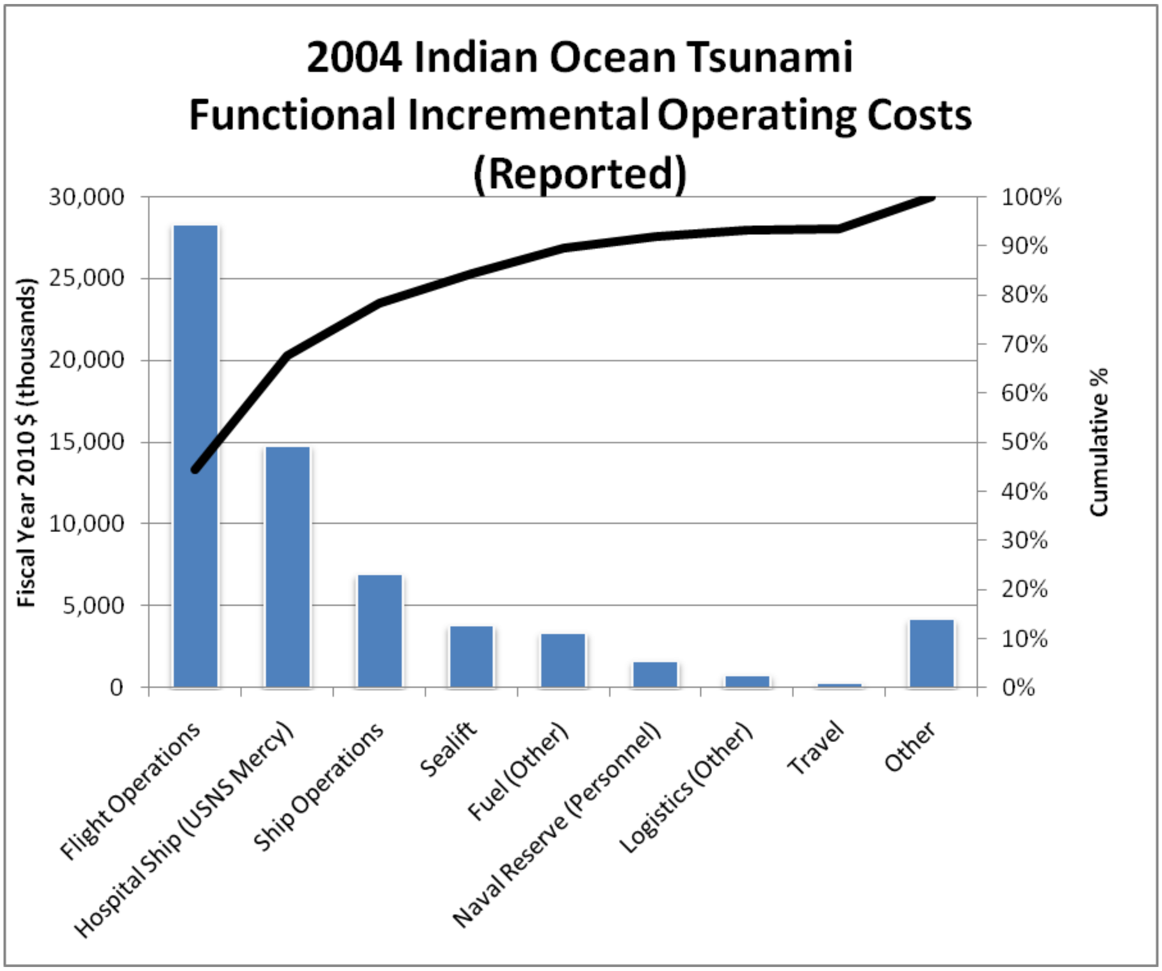

Figure 6. 2004 Indian Ocean Tsunami Functional Incremental Operating Costs (Reported)

B. THE 2010 HAITI EARTHQUAKE

1. Introduction

As one would likely expect, given that the 2010 Haiti earthquake was a more recent HA/DR operation, there is less literature evaluating the DoD's Operation Unified Response. The Congressional Research Service report titled *Haiti Earthquake: Crisis and Response*, by Rhoda Margesson and Maureen Taft-Morales (2010), presented a *whole of government* response synthesis only two months after the disaster but understated the U.S. Navy's commitment by leaving out ships that responded to the initial disaster, including an aircraft carrier and amphibious ships. The report included aggregated fiscal data and also international financial contributions.

In her paper for the Naval War College, *Matching Objectives in Disaster Relief Efforts: A Critical Evaluation of the U.S. Response in Haiti,* Megan Thomas (2010) provided an operational and strategic discussion but did not address cost or processes associated with fiscal law.

2. Financial Analysis

The 2010 earthquake that devastated Haiti and incapacitated its government presents an interesting case for study. Even though officials who work in the humanitarian space state that every single disaster is different, if an HA/DR archetype existed, Haiti would have well exceeded it. The U.S. Navy's response, massive in scale, was enabled by the proximity of Fleet Forces Command (formerly known as the U.S. Atlantic Fleet) and well suited to the localized, sudden-onset nature of the disaster.

Thanks to how recently the event occurred, 1,565 electronic files of original source financial data were available from OASN(FM&C) for this thesis. Occurring in FY2010, the financial data required no escalation for inflation. The Navy was most involved immediately after the earthquake. While the U.S. Government and NGOs continue providing aid, the Navy's involvement has reduced. Figure 7 depicts the financial obligations associated with the level of involvement, and for the purposes of this thesis, I limited analysis to the first 18 weeks following the earthquake.

Figures 7 and 8 present the weekly time-series of financial obligations as they were recorded. Over 50%, approximately $82 million, of the 18-week incremental costs were obligated by the third week of the event. Three categories dominate among these initial obligations: flight operations, ships operations, and the hospital ship USNS *Comfort* (T-AH 20). As with the tsunami response, the importance of helicopter vertical lift capacity cannot be overstated, but as a percent of total incremental cost, as depicted in Figure 7, flight operations represented only 30% of 18-week expenditures. One might conclude that there was less relative importance in the flying mission when comparing this response to that of the 2004 Indian Ocean tsunami. Actually, flight operations in the Haiti response exceeded the tsunami response by $15 million, adjusted for inflation. Instead, the scope of ship operations and massive response of the fleet crowded out the incremental cost of flight operations.

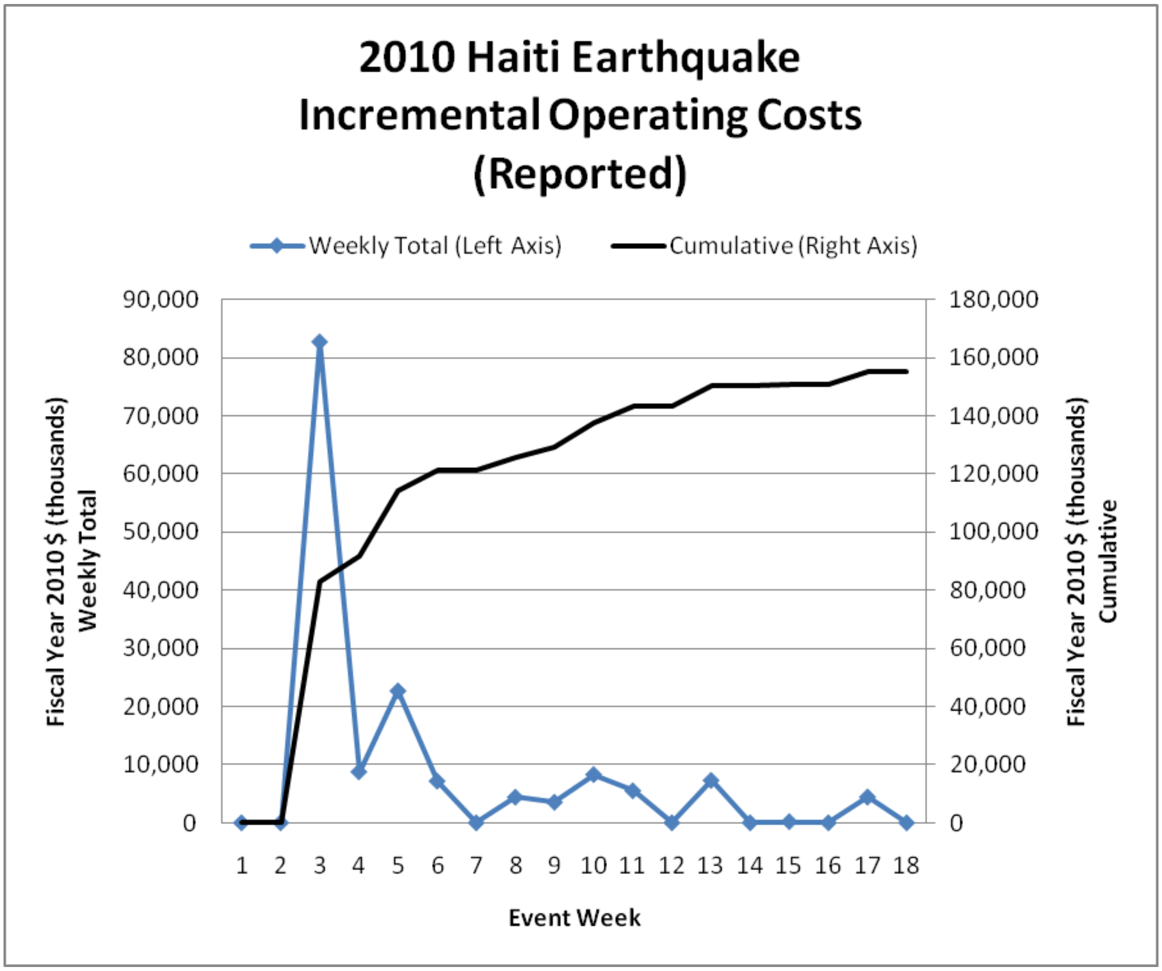

Figure 7. 2010 Haiti Earthquake Incremental Operating Costs (Reported)

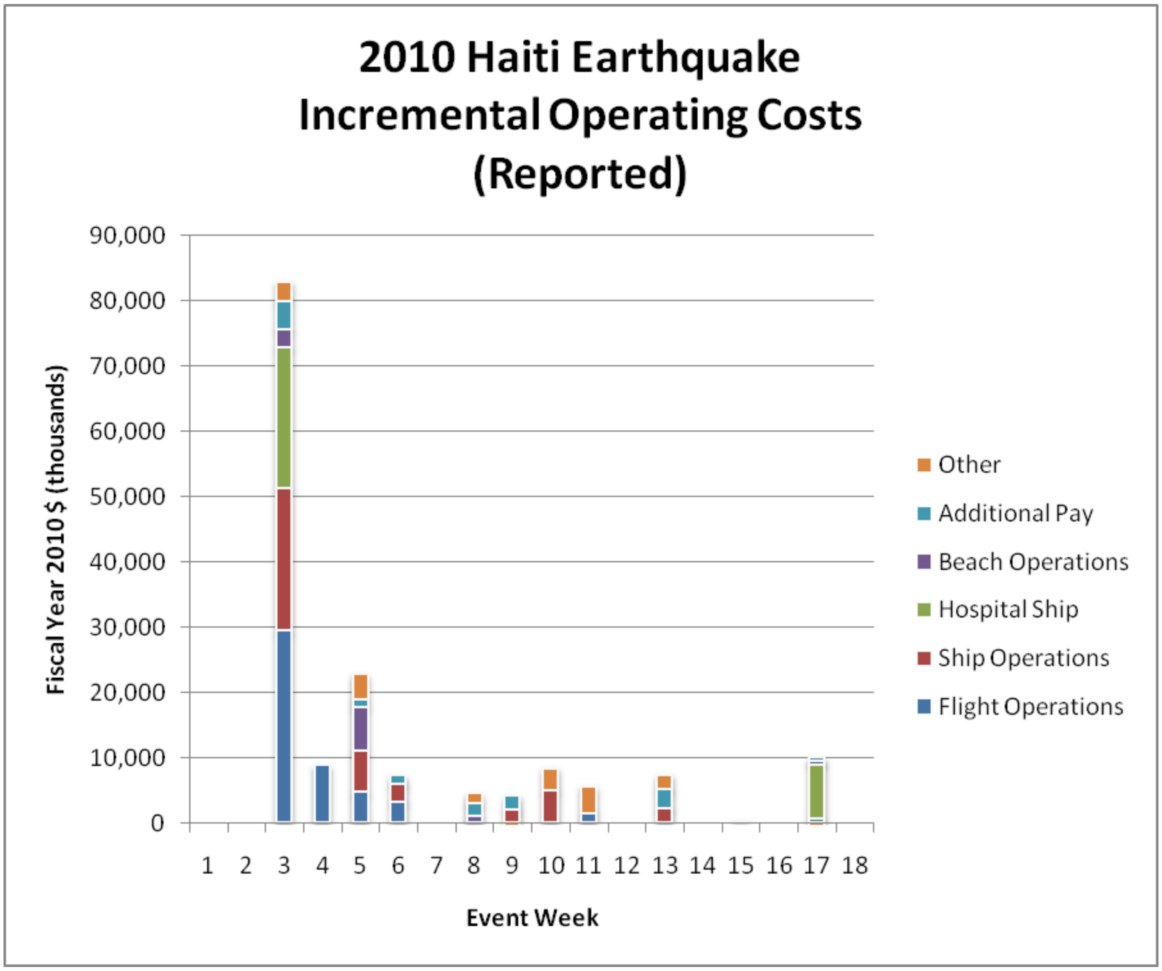

Figure 8. 2010 Haiti Earthquake Incremental Operating Costs (Reported)

Ship operation costs, nearly $22 million during the first three weeks, were higher because ships were ordered to deploy specifically for the HA/DR mission. Those not already in the area incurred rapid stocking, surge, and transit costs.

However, an intriguing aspect of the data is the timing of the costs for the hospital ship. The decision to deploy the USNS *Comfort* brought with it a front-loaded cost of about $20 million. This was a similar planning factor in the response to the tsunami. Figure 9 shows the contribution of hospital ship costs during the first three weeks.

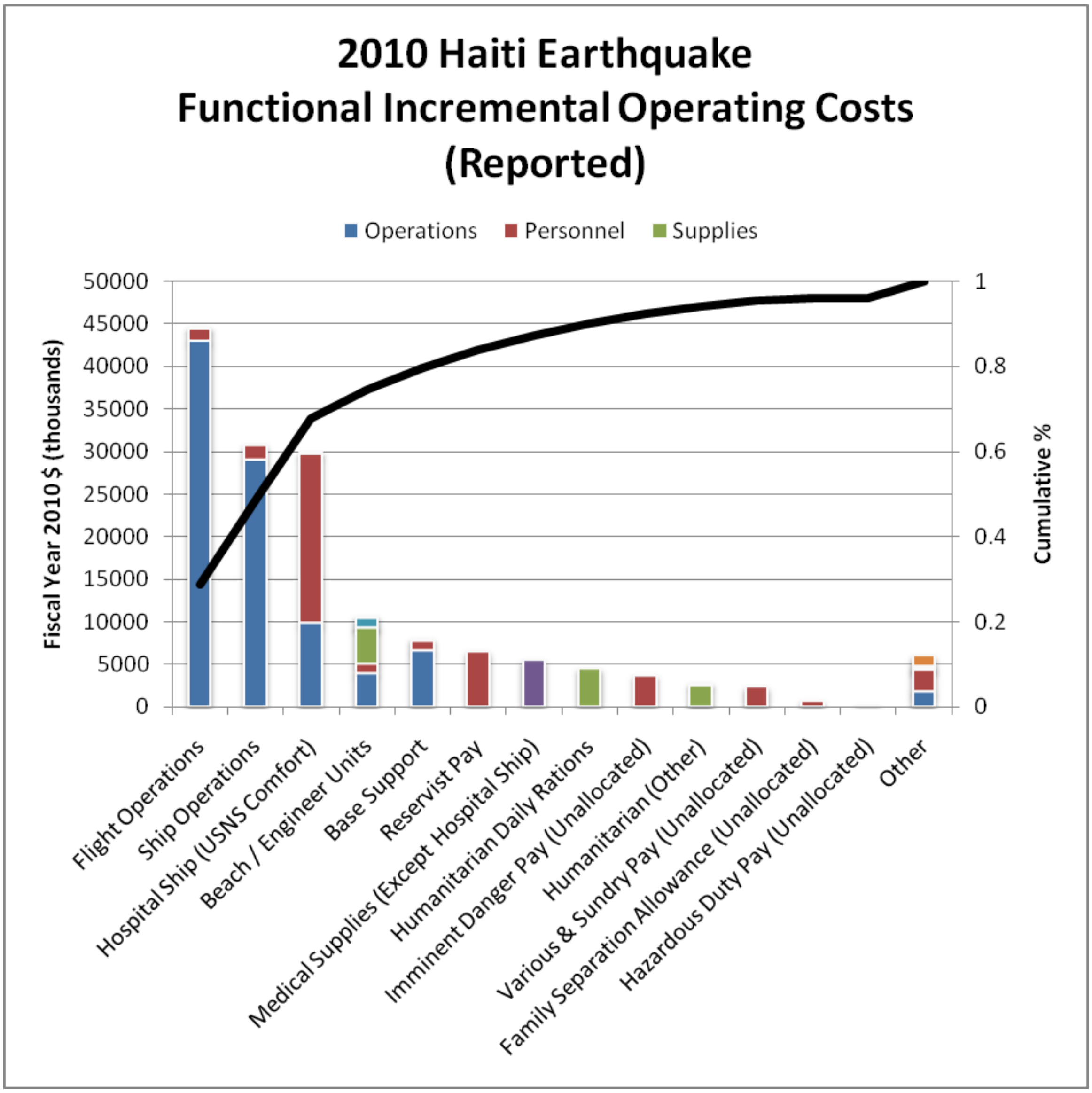

Figure 9. 2010 Haiti Earthquake Functional Incremental Operating Costs (Reported)

The functional analysis of the incremental costs presents a few other interesting items. The significant destruction of infrastructure in the city, as well as the port facility of Port-au-Prince, required a larger footprint of personnel on the ground. Those costs are accumulated in "Beach/Engineering Units," one of which included the mission of re-opening the port to accept aid shipments by sea. Another interesting item is a relatively large expense titled "Base Support." Expecting a significant refugee population, the Navy prepared temporary housing facilities at Naval Station Guantanamo Bay. This expense item also included cranes and vehicles that had to be leased to facilitate the surge of the fleet. Finally, the existence of the expense item "Imminent Danger Pay" is interesting in that it was not included in the estimates generated by the COST model used by Navy financial planners. The line item is listed but with a budget of zero. According to Volume 7, Chapter 10 of the *FMR*, Imminent Danger Pay has been an entitlement for any personnel operating on the land area of Haiti since November 1994 (USD[C], 2009). As in the tsunami response in Indonesia, sea basing yielded cost savings in this particular line item; however, because of the greater number of personnel operating ashore, this unplanned cost item stands out.

C. THE 2010 FLOODS IN PAKISTAN

1. Introduction

The flooding in Pakistan in 2010 provides the only case of an HA/DR operation in response to a slow-onset disaster. For the purposes of this analysis, I have considered the disaster event date to be the start of the rains that led to the floods.

2. Financial Analysis

As expected, incremental costs were slower in coming, since the first significant obligation occurred in the sixth week of the event. While total costs were lower than those of the previous two cases, the costs were spread out over time and did not show the same massive initial spike as did the two sudden-onset disasters.

An interesting aspect of the time-series operating costs, depicted in Figures 10 and 11, is the existence of negative numbers. These negative numbers appear in the cost categories for ship operations, since costs were incurred to hasten the scheduled deployments of several ships from their home ports in the U.S., only to be re-tasked at some point prior to their performing any HA/DR. This represents a costly balk, requiring the Navy to absorb those additional costs with other operations and maintenance accounts. From a business process inefficiency standpoint, this financial repercussion caused by the delay in responding to the disaster also belies the underlying theme of all the HA/DR missions: that the best military aid should arrive quickly. After the initial demand is met with expensive military sources to save lives and relieve the worst suffering, logistics services can be more economically sourced to civilian or commercial outfits. The significant delay before those ships could be on-station negated their usefulness.

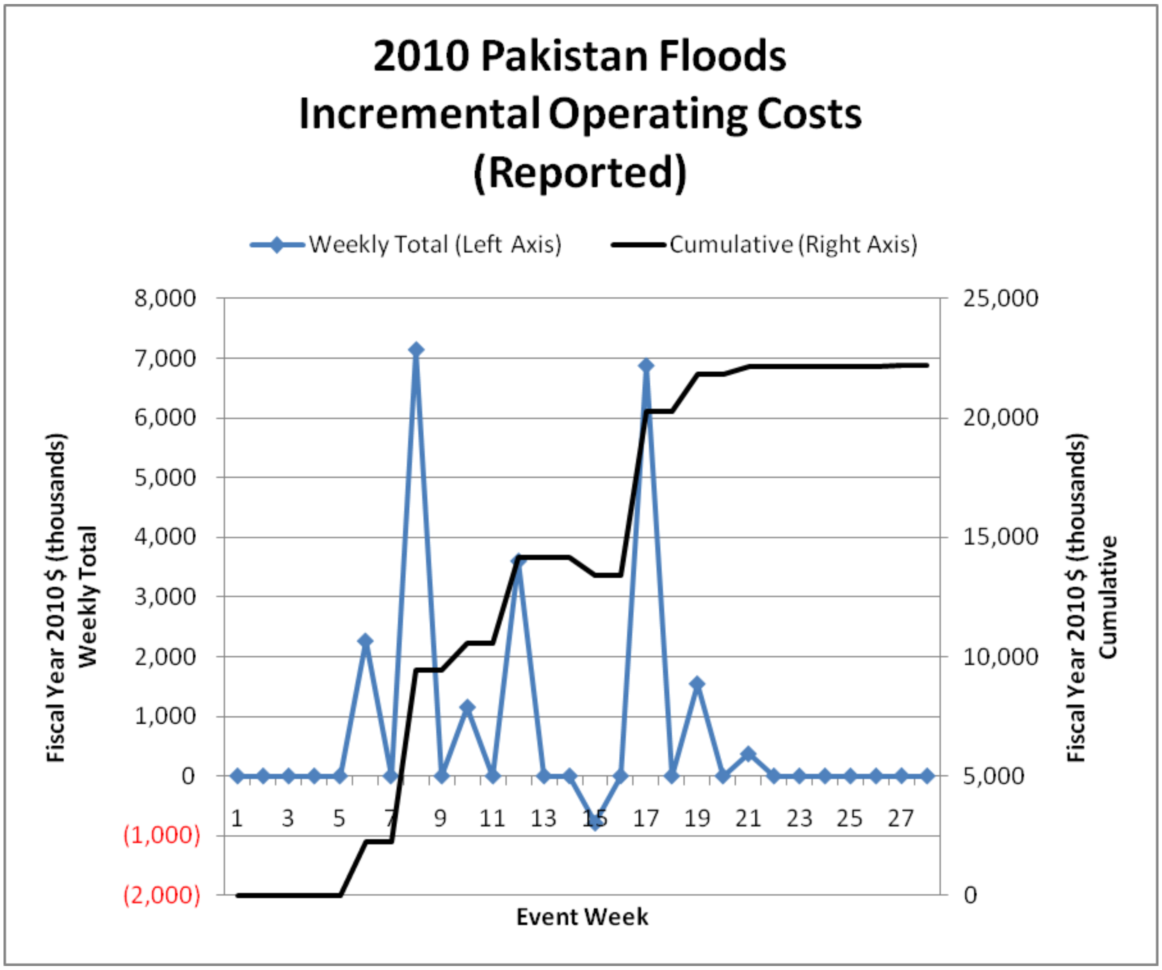

Figure 10. 2010 Pakistan Floods Incremental Operating Costs (Reported)

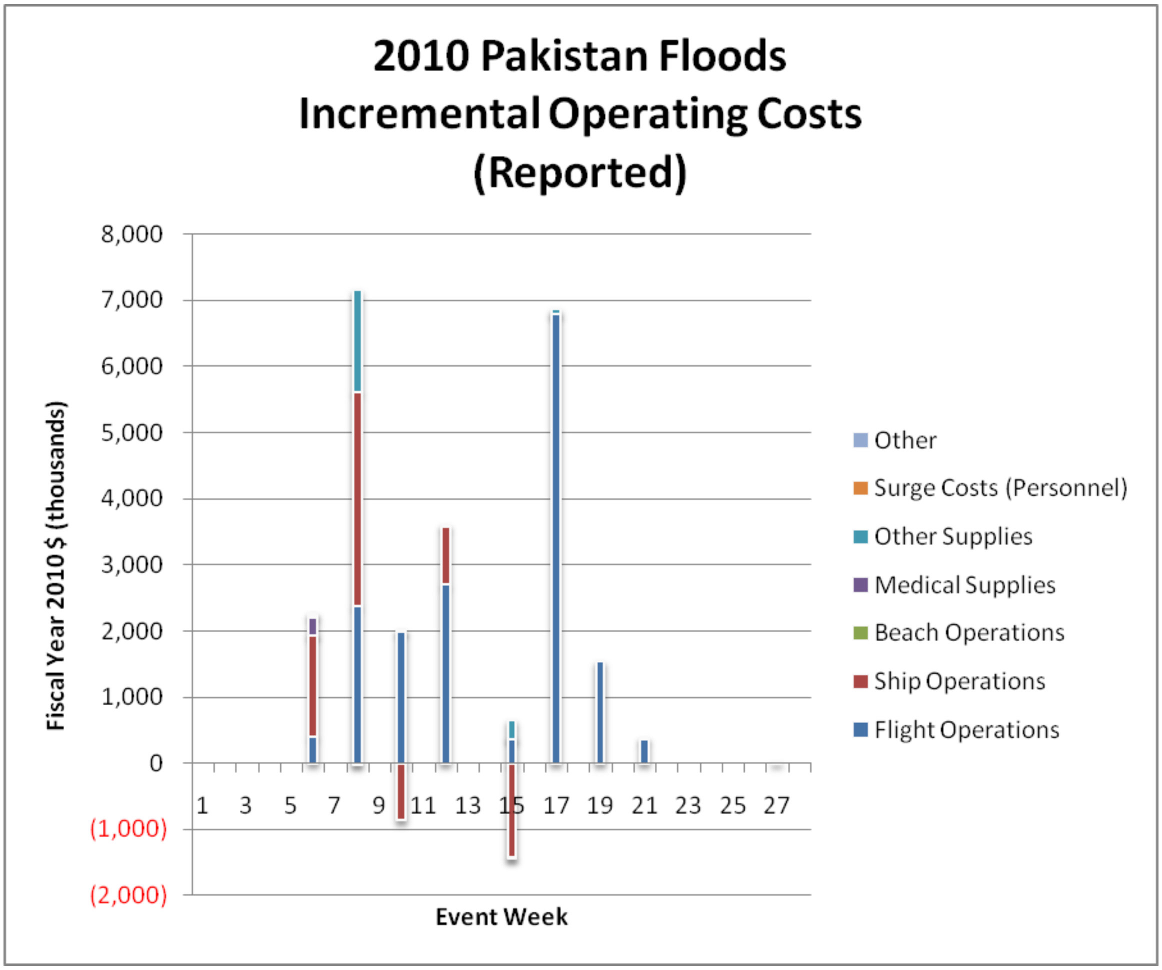

Figure 11. 2010 Pakistan Floods Incremental Operating Costs (Reported)

As depicted in Figure 12, flight operations once again represented the lion's share of incremental costs—in this case, nearly 80% of total incremental costs after 28 weeks. Next to that, ship operations round out the bulk of the costs.

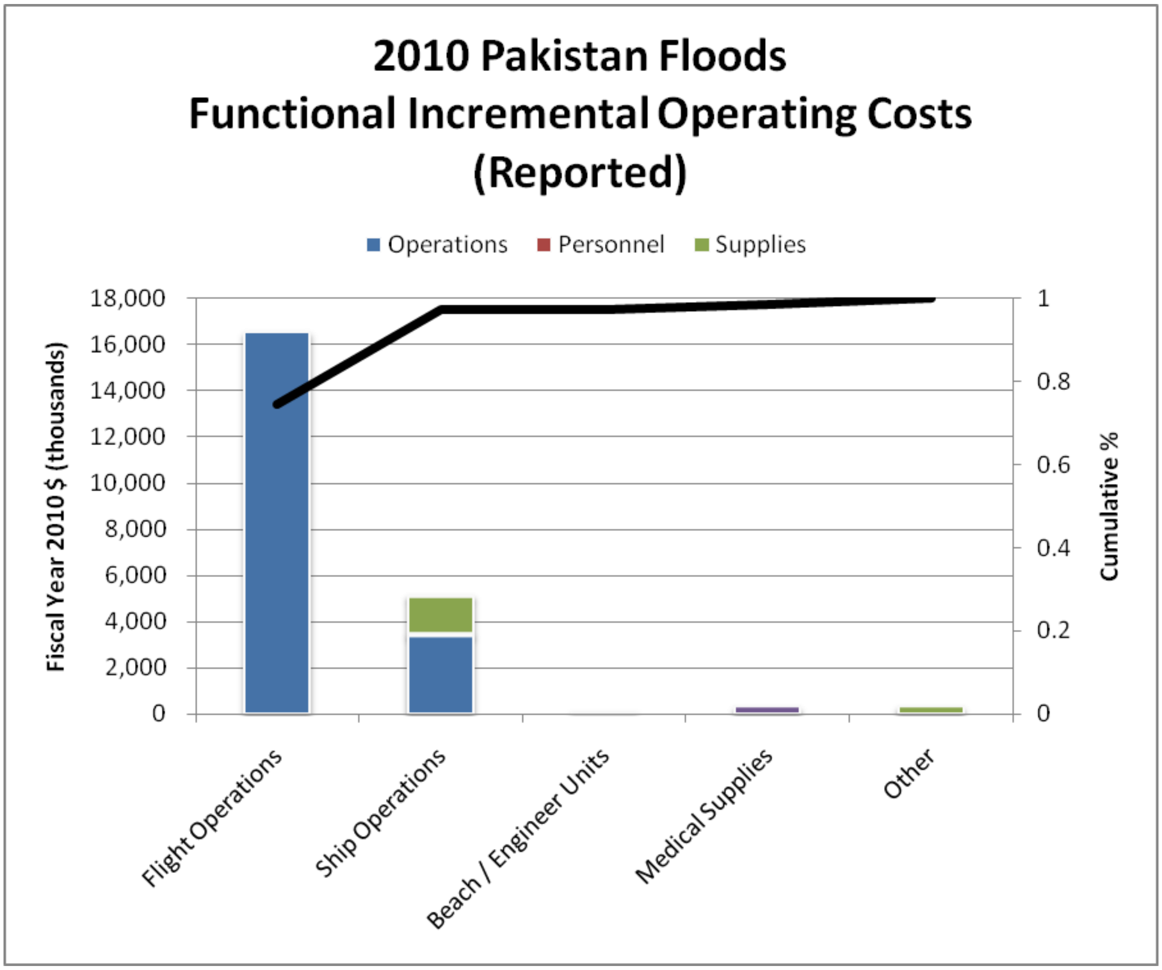

Figure 12. 2010 Pakistan Floods Functional Incremental Operating Costs (Reported)

D. CROSS COMPARISON

Figure 13 depicts the time-series of financial obligations for all three case studies. The two sudden-onset disasters (Indian Ocean tsunami and Haiti earthquake) present a massive initial spike as military forces fulfill demand until civilian or commercial logistics come up to speed. The slow-onset disaster (Pakistan floods), significantly smaller in scope, depicts less variability. All three cases place helicopter vertical lift as the most demanded function.

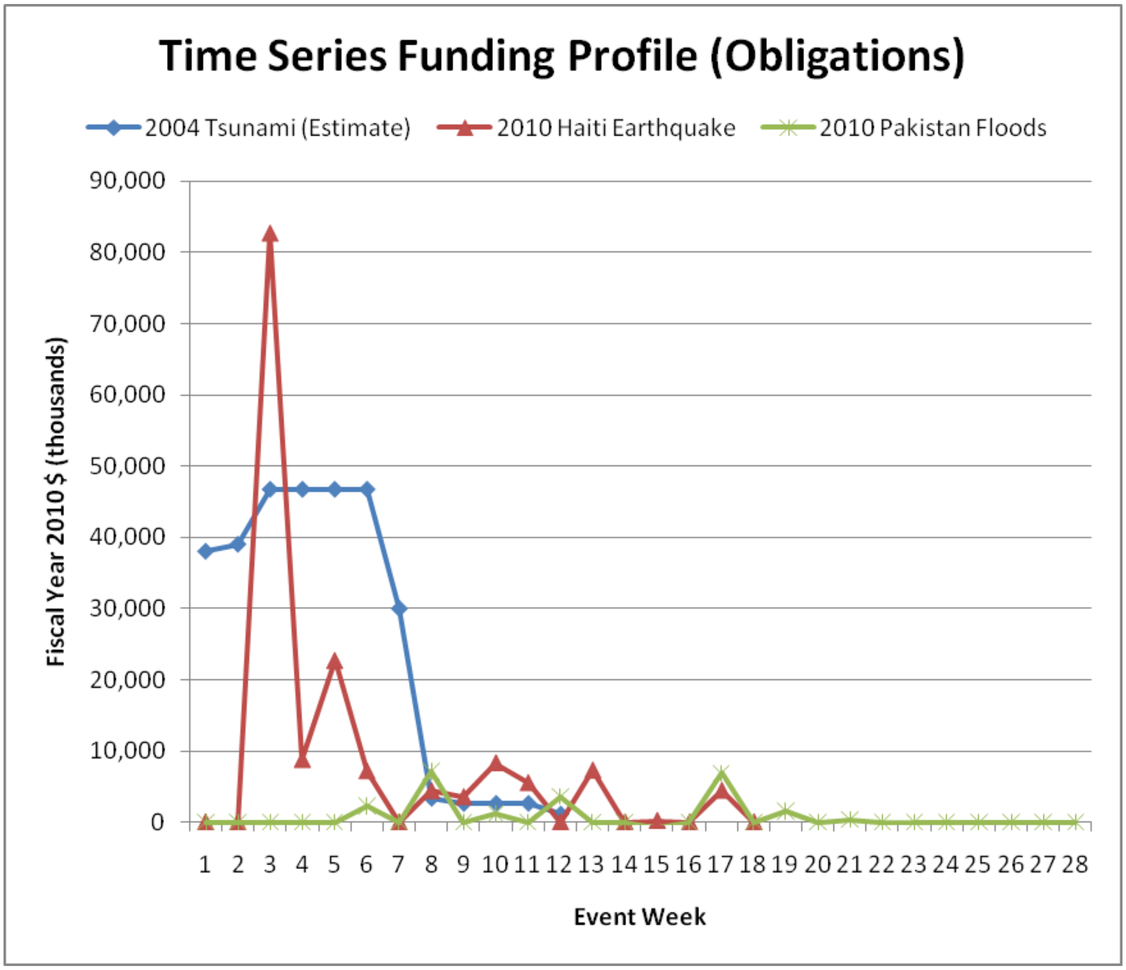

Figure 13. Time Series Funding Profile (Obligations)

Figure 14 synthesizes the disaster classification matrix introduced in Figure 2, with the final incremental cost of the response to the Department of the Navy (DoN) during the analysis period. That the incremental cost of the response to the Haiti earthquake exceeds the cost of the response to the Indian Ocean tsunami by a multiple of 2.4 is unexpected and inconsistent with the hypothesis that a dispersed disaster presents greater difficulty than a localized one. However, Haiti's proximity to the United States and the availability of military assets likely skewed the costs through inefficient resource allocation.

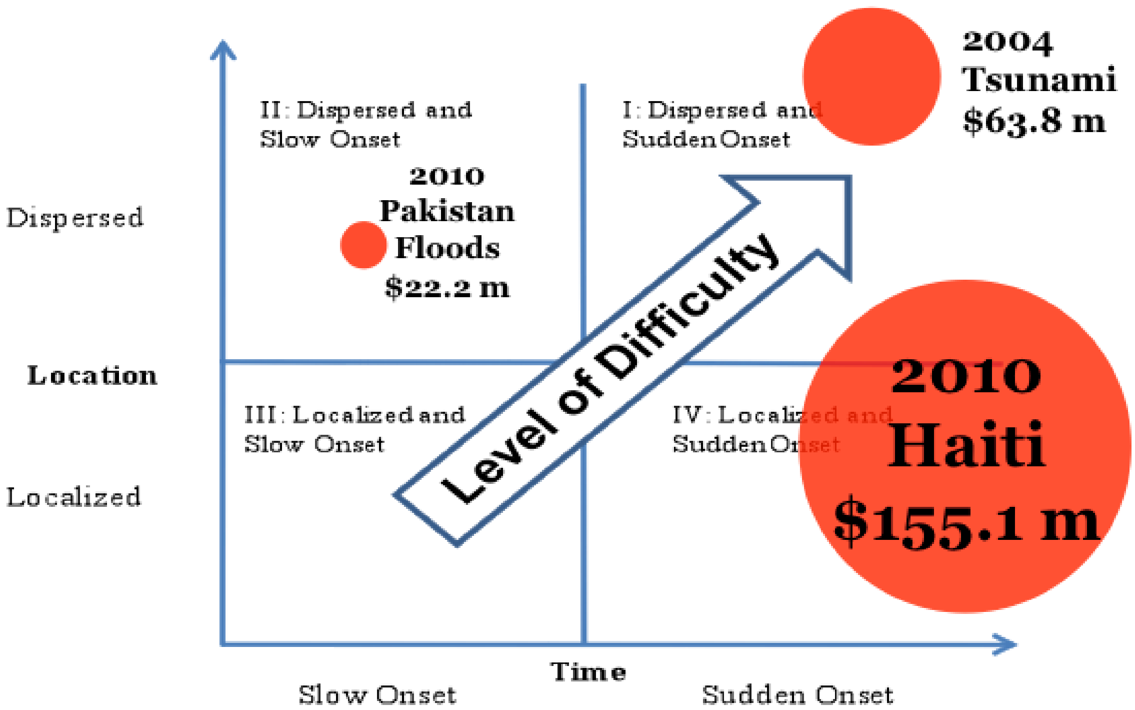

Figure 14. Disaster Classification Matrix and Incremental Cost of Response
(Apte, 2009)

E. THE 2011 COMPLEX DISASTER IN JAPAN 2011—SUDDEN-ONSET, SLOW-ONSET, DISPERSED CRISIS

While I have identified three very different types of disasters and their financial implications for the DoD, it would be an oversight to make no mention of a disaster that occurred during the drafting of this thesis. On March 11, 2011, a massive, 9.0-magnitude earthquake occurred near the northeast coast of Honshu, Japan, at the subduction zone plate boundary between the Pacific and North America plates (USGS, 2011). The earthquake triggered a tsunami that wiped out entire towns in Japan and propagated across the Pacific Ocean. Both the earthquake and the tsunami were sudden-onset disasters that affected a dispersed geographic area. The combination of the earthquake and tsunami caused a third, radiological crisis as backup cooling systems at the Fukushima Dai-ichi Nuclear Power Plant, located on the affected northeast coast of Honshu, Japan, failed after suffering inundation from the tsunami. This nuclear crisis was a slow-onset event that affected a dispersed geographic region due to the radiation emitted by the plant. All three of the disasters—triggered by a large earthquake—are significant, and each would warrant a substantial military HA/DR mission. However, taken together, these three disasters constitute a dispersed, sudden-onset, slow-onset, and therefore complex, disaster event. Despite Japan's wealth, its industrialization, and its level of national emergency preparedness, military assistance in the form of helicopter vertical lift was still central to the U.S. response, and ships deployed specifically to act as fueling stations to support those helicopter functions.

V. CONCLUSION AND RECOMMENDATIONS

Decision-makers should expect an obligation profile for HA/DR to reflect the speed of onset. A sudden-onset will result in a massive spike, because massive capacity is demanded. Expenditures responding to a disaster will be significant until logistics services can be sourced to a more economical provider.

Helicopter vertical lift will be the most highly demanded service, and generate the greatest costs. From a whole of government approach, the DoD is best suited to provide this particular service in sufficient scale and with the needed timeliness, since it possesses the only ready fleet of such assets. The investment in that capability is a sunk cost in the decision matrix.

Ship operations will be a material cost driver, but they should be used in a way that best supports the primary helicopter mission. To that end, large, flat flight decks provide the best platforms.

A hospital ship is a significant investment in an HA/DR mission, and there are huge up-front costs when the deployment order is given. For that reason, a hospital ship must remain on-station long enough to recoup those costs, serve a symbolic purpose in the national interest, or provide some extra measure of military flexibility that outweighs its uneconomical characteristics. In all but the most extreme cases, a field hospital or medical treatment facility in a large-deck amphibious ship or aircraft carrier might provide the required level of service, at a fraction of the cost, with greater immediacy. This immediacy is the most important requirement.

A. RECOMMENDATIONS

The U.S. Navy should focus on accurate forecasting of the required level of service for helicopter vertical lift, ship platforms that facilitate that service, and hospital ships. Getting these three functions right will better utilize the Navy's unique core competencies.

It is important to recognize that obligations come in rapid-fire fashion and then disappear almost as fast. An organization that can dispose of the financial transfers quickly and efficiently will allow the Navy to plan, respond, and move on. Since the operations are decentralized under the respective COCOMs, differences between organizations might cause inconsistencies that delay the process. Utilizing a team of operational comptrollers available to deploy and augment the responding command could standardize the funds transfer process.

If HA/DR is to remain a naval core competency, future acquisition programs must reflect this status. The capacity for helicopter vertical lift needed for HA/DR is complementary to that required for combat operations. Ships that facilitate that capability will provide greater utility. Furthermore, decentralized medical treatment facilities that can arrive on station quicker will be more economical than hospital ships that arrive after considerable delay.

The best way to maximize the capabilities that currently exist will be through improved information sharing. The lessons learned in the response to the Indian Ocean tsunami, when naval forces lacked the ability to communicate with other stakeholders on unclassified networks, should provide the template. Applying new technologies from the fields of human terrain mapping and crowd sourcing will allow the Navy to plug into the already substantial aid network. Sharing information that allows the Navy to deliver the right aid at the right time will do more to maximize scarce resources.

B. FUTURE STUDY

HA/DR stakeholders within the U.S. Navy should compare the costs to the utility of each platform to try to optimize the delivery of aid. Currently, other studies are underway to seek to identify the types of assets that have responded to past disasters and to assign a measure of utility using their time on station as a proxy. Linking the benefits provided to the costs incurred would allow future planners to try to optimize scarce resources in future HA/DR missions.

HA/DR stakeholders within the U.S. Navy should apply the same lessons learned in cost-estimating for major acquisition programs to these contingency operations.

Linking the cost elements of past HA/DR missions to the type, size, or scope of the disaster might give planners a better idea of how they will choose to finance the operation.

HA/DR stakeholders within the DoD should apply the concepts of human terrain mapping and crowd sourcing to the requisition and delivery of aid. Investments in a network that facilitates information sharing for the purposes of aid requisition, logistics and aircraft scheduling, disaster and delivery geo-location, and mission feedback may yield cost savings through improved efficiencies. These capabilities could then be migrated into the medical treatment process, helping to bridge the information gap between local officials and medical service providers for purposes of patient accountability.

Although the common thread in the HA/DR community is that every disaster is different, past demand for helicopter vertical lift should provide insight into the nature and scale of services needed in the future. Efforts to improve information sharing and collaboration will best leverage the military's unique core competencies, making the most of precious, limited resources and allowing the DoD to continue to respond to disasters around the world.

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

Apte, A. (2009). Humanitarian logistics: A new field of research and action. *Foundations and Trends® in Technology, Information and Operations Management, 3*(1), 1–100. doi:10.1561/0200000014

Defense Logistics Agency (DLA). (2011). *Troop support, subsistence, operational rations*. Retrieved from http://www.dscp.dla.mil/subs/rations/programs/hdr/hdrabt.asp

Defense Security Cooperation Agency (DSCA). (2011). *Fiscal year 2012 budget estimates: Overseas humanitarian, disaster assistance, and civic aid (OHDACA).* Washington, DC: Department of Defense.

Department of Defense (DoD). (2006). *FY2007 budget estimate submission: Overseas humanitarian, disaster assistance, and civic aid (OHDACA).* Washington, DC: Author.

Department of Defense (DoD). (2011). *FY2012 budget estimate submission.* Washington, DC: Author.

Department of State (DoS). (2010). *Devastating floods in Pakistan: U.S. Secretary of State calls for worldwide help* [Press release]. Retrieved from http://www.state.gov

Department of State (DoS), & United States Agency for International Development (USAID). (2010). *FY2010 Haiti supplemental budget justification*. Washington, DC: Authors.

Department of the Navy, (DoN), & United States Coast Guard (USCG). (2007). *A cooperative strategy for 21st century seapower*. Washington, DC: Authors.

Elleman, B. A. (2007). Waves of hope: The U.S. Navy's response to the tsunami in northern Indonesia. *Naval War College Newport Papers, 28.* Newport, RI: Naval War College, Center for Naval Warfare Studies.

Factor, M. (2011, March 28). Capital flows: What's the real defense budget? *Forbes*, 24.

Garrison, R. H., Noreen, E. W., & Brewer, P. C. (2010). *Managerial accounting* (13th ed.). New York, NY: McGraw-Hill Irwin.

Government Accountability Office (GAO). (2008, September). *Defense budget: Independent review is needed to ensure DoD's use of cost estimating tool for contingency operations follows best practices* (GAO-08-982). Washington, DC: Author.

Government Accountability Office (GAO). (2009, March). *GAO cost estimating and assessment guide: Best practices for developing and managing capital program costs* (GAO-09-3SP). Washington, DC: Author.

Halvorsen, D., Caldwell, J., & Gurwith, N. (2011, January 31). Interview by S. A. Ures [Digital recording]. Defense Security Cooperation Agency, Arlington, VA.

Institute for Defense Analyses (IDA). (2011, February). *Introduction to the contingency operations support tool* (Unpublished PowerPoint presentation). Alexandria, VA: Author.

Margesson, R., & Taft-Morales, M. (2010). *Haiti earthquake: Crisis and response* (CRS Report #R41023). Washington, DC: Congressional Research Service.

Naval Center for Cost Analysis (NCCA). (2011). Joint inflation calculator (Version FY2012) [Computer software]. Retrieved from https://www.ncca.navy.mil/tools.inflation.cfm

Number of disasters per year. (2009). In *UNEP/GRID-Arendal Maps and Graphics Library*. Retrieved from http://maps.grida.no/go/graphic/number-of-disasters-per-year

Office of the Chairman of the Joint Chiefs of Staff (OCJCS). (2009, March 17). *Foreign disaster assistance* (Joint publication [JP] 3-29). Washington, DC: Author.

Perry, C. M., & Travayiakis, M. (2008). *The U.S. foreign disaster response process*. Cambridge, MA: The Institute for Foreign Policy Analysis.

Rogers, A. (2011, January 31). Interview by S. A. Ures [Digital recording]. Office of the Under Secretary of Defense (Comptroller), The Pentagon, Arlington, VA.

Telford, J., Cosgrave, J., & Houghton, R. (2006). *Joint evaluation of the international response to the Indian Ocean tsunami: Synthesis report.* London, United Kingdom: Tsunami Evaluation Coalition.

Thomas, M. A. (2010). *Matching objectives in disaster relief efforts: A critical evaluation of the U.S. response in Haiti*. Newport, RI: Naval War College.

Under Secretary of Defense, Comptroller (USD[C]). (2007, September). Contingency operations (DoD FMR 7000.14-R). *DoD Financial Management Regulation* (Vol. 12). Washington, DC: Author.

Under Secretary of Defense, Comptroller (USD[C]). (2009, May). Special pay—Duty subject to hostile fire or imminent danger (DoD FMR 7000.14-R). *DoD Financial Management Regulation* (Vol. 7A). Washington, DC: Author.

Under Secretary of Defense for Policy (USD[P]). (2009, September 16). Stability operations (DoD Instruction 3000.05). Washington, DC: Author.

United States Agency for International Development (USAID). (2005). *Indian Ocean—earthquake and tsunamis* (Fact Sheet #29, FY2005). Retrieved from http://www.usaid.gov/press/factsheets/2005/

United States Agency for International Development (USAID). (2010c). *Haiti—earthquake* (Fact Sheet [series], FY2010). Retrieved from http://www.usaid.gov/our_work/humanitarian_assistance/disaster_assistance/countries/haiti/template/reports.html

United States Agency for International Development (USAID). (2011a). *Haiti—earthquake* (Fact Sheet [series], FY2011). Retrieved from http://www.usaid.gov/our_work/humanitarian_assistance/disaster_assistance/countries/haiti/template/reports.html

United States Geological Survey (USGS). (2010). *M 7.0, Haiti region*. (PAGER, Version 1). Retrieved from http://earthquake.usgs.gov/earthquakes/pager/events/us/2010rja6/onepager.pdf

United States Geological Survey (USGS). (2011). *Magnitude 9.0—Near the east coast of Honshu, Japan, 2011 March 11 05:46:23 UTC*. Retrieved from http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/

Vego, M. (2007). *Joint operational warfare: Theory and practice*. Newport, RI: Naval War College.

THIS PAGE INTENTIONALLY LEFT BLANK

2003 - 2011 SPONSORED RESEARCH TOPICS

Acquisition Management

- Acquiring Combat Capability via Public-Private Partnerships (PPPs)
- BCA: Contractor vs. Organic Growth
- Defense Industry Consolidation
- EU-US Defense Industrial Relationships
- Knowledge Value Added (KVA) + Real Options (RO) Applied to Shipyard Planning Processes
- Managing the Services Supply Chain
- MOSA Contracting Implications
- Portfolio Optimization via KVA + RO
- Private Military Sector
- Software Requirements for OA
- Spiral Development
- Strategy for Defense Acquisition Research
- The Software, Hardware Asset Reuse Enterprise (SHARE) repository

Contract Management

- Commodity Sourcing Strategies
- Contracting Government Procurement Functions
- Contractors in 21st-century Combat Zone
- Joint Contingency Contracting
- Model for Optimizing Contingency Contracting, Planning and Execution
- Navy Contract Writing Guide
- Past Performance in Source Selection
- Strategic Contingency Contracting
- Transforming DoD Contract Closeout
- USAF Energy Savings Performance Contracts
- USAF IT Commodity Council
- USMC Contingency Contracting

Financial Management

- Acquisitions via Leasing: MPS case

- Budget Scoring
- Budgeting for Capabilities-based Planning
- Capital Budgeting for the DoD
- Energy Saving Contracts/DoD Mobile Assets
- Financing DoD Budget via PPPs
- Lessons from Private Sector Capital Budgeting for DoD Acquisition Budgeting Reform
- PPPs and Government Financing
- ROI of Information Warfare Systems
- Special Termination Liability in MDAPs
- Strategic Sourcing
- Transaction Cost Economics (TCE) to Improve Cost Estimates

Human Resources

- Indefinite Reenlistment
- Individual Augmentation
- Learning Management Systems
- Moral Conduct Waivers and First-term Attrition
- Retention
- The Navy's Selective Reenlistment Bonus (SRB) Management System
- Tuition Assistance

Logistics Management

- Analysis of LAV Depot Maintenance
- Army LOG MOD
- ASDS Product Support Analysis
- Cold-chain Logistics
- Contractors Supporting Military Operations
- Diffusion/Variability on Vendor Performance Evaluation
- Evolutionary Acquisition
- Lean Six Sigma to Reduce Costs and Improve Readiness
- Naval Aviation Maintenance and Process Improvement (2)
- Optimizing CIWS Lifecycle Support (LCS)
- Outsourcing the Pearl Harbor MK-48 Intermediate Maintenance Activity

- Pallet Management System
- PBL (4)
- Privatization-NOSL/NAWCI
- RFID (6)
- Risk Analysis for Performance-based Logistics
- R-TOC AEGIS Microwave Power Tubes
- Sense-and-Respond Logistics Network
- Strategic Sourcing

Program Management

- Building Collaborative Capacity
- Business Process Reengineering (BPR) for LCS Mission Module Acquisition
- Collaborative IT Tools Leveraging Competence
- Contractor vs. Organic Support
- Knowledge, Responsibilities and Decision Rights in MDAPs
- KVA Applied to AEGIS and SSDS
- Managing the Service Supply Chain
- Measuring Uncertainty in Earned Value
- Organizational Modeling and Simulation
- Public-Private Partnership
- Terminating Your Own Program
- Utilizing Collaborative and Three-dimensional Imaging Technology

A complete listing and electronic copies of published research are available on our website: www.acquisitionresearch.org

THIS PAGE INTENTIONALLY LEFT BLANK

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

www.acquisitionresearch.org