

ALTERNATIVE DISASTER FEEDING RATION

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
Homeland Security

by
GEORGE WILLIAM ROLLINSON, MAJOR, U.S. ARMY
B.A., State University of New York, Potsdam, New York, 1999

Fort Leavenworth, Kansas
2012-01

Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE			<i>Form Approved</i> <i>OMB No. 0704-0188</i>		
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 08-06-2012		2. REPORT TYPE Master's Thesis		3. DATES COVERED (From - To) AUG 2011 – JUN 2012	
4. TITLE AND SUBTITLE Alternative Disaster Feeding Ration			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) MAJ George William Rollinson			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Command and General Staff College ATTN: ATZL-SWD-GD Fort Leavenworth, KS 66027-2301			8. PERFORMING ORG REPORT NUMBER		
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for Public Release; Distribution is Unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT FEMA and USAID could more efficiently provide feeding rations during Humanitarian Assistance / Disaster Relief (HA/DRs) operations by using high calorie survival bars in lieu of MREs and HDRs while saving time, money, and resources. The Department of Defense (DOD) and Department of Homeland Security (DHS) primarily use Meals Ready to Eat (MREs) and Humanitarian Daily Rations (HDRs) for foreign and domestic humanitarian disaster response operations. Rations currently used are costly and logistically challenging to manage. MREs possess twice the shelf life and size as HDRs, but also double costs and bring cultural concerns. An alternative solution is the nutritionally balanced, condensed survival ration bars that have a longer shelf life and are inexpensive. There are potential issues with public image or relations with each ration type: MREs are not vegetarian; HDRs are religiously sensitive; and high calorie bars appear minimalistic implying lack of compassion. Each ration should also be assessed against the principles of sustainment as directed in FM 4-0. This thesis will assess logistical implications, both negative and positive, of using the survival ration bars in lieu of MREs and HDRs during disaster relief operations led by USAID and FEMA.					
15. SUBJECT TERMS Disaster Relief; Food Rations; Meals, Ready to Eat (MREs); Humanitarian Daily Rations (HDRs); Ration Bars.					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. PHONE NUMBER (include area code)
(U)	(U)	(U)	(U)	73	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Major George William Rollinson

Thesis Title: Alternative Disaster Feeding Ration

Approved by:

_____, Thesis Committee Chair
Eric M. Morrison, P.h.D

_____, Member
Allan S. Boyce, M.S.

_____, Member
Major Donald R. Ferguson, M.A.

Accepted this 8th day of June 2012 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

ALTERNATIVE DISASTER FEEDING RATION, by George William Rollinson, 73 pages.

FEMA and USAID could more efficiently provide feeding rations during Humanitarian Assistance / Disaster Relief (HA/DRs) operations by using high calorie survival bars in lieu of MREs and HDRs while saving time, money, and resources. The Department of Defense (DOD) and Department of Homeland Security (DHS) primarily use Meals Ready to Eat (MREs) and Humanitarian Daily Rations (HDRs) for foreign and domestic humanitarian disaster response operations. Rations currently used are costly and logistically challenging to manage. MREs possess twice the shelf life and size as HDRs, but also double costs and bring cultural concerns. An alternative solution is the nutritionally balanced, condensed survival ration bars that have a longer shelf life and are inexpensive. There are potential issues with public image or relations with each ration type: MREs are not vegetarian; HDRs are religiously sensitive; and high calorie bars appear minimalistic implying lack of compassion. Each ration should also be assessed against the principles of sustainment as directed in FM 4-0. This thesis will assess logistical implications, both negative and positive, of using the survival ration bars in lieu of MREs and HDRs during disaster relief operations led by USAID and FEMA.

ACKNOWLEDGMENTS

I would like to dedicate this thesis for those who have gone to bed hungry without food during disasters. This is not a cheery subject. However, it is important in my eyes. I hope this has an immediate application for you knowing that tomorrow it could be me.

I would like to thank my committee for all their guidance and mentorship during this process. This was educational for me on so many levels. I learned how to conduct academic research and how its results can make a difference developing policy which affects people in need, who might also be someone I know or love. I fully appreciate the importance of managing several academic requirements. It was your leadership and advice that taught me how to best to manage my scholastic and family time creating a balance that saw me through until the end. Your insights helped me develop in ways I was not prepared for. Thank you for the guidance.

I would like to thank SGM Scott Dugan and CW4 Jeffrey Manninen who educated me on many aspects of food service back in the day. Their professionalism in teaching the power of food service and how it affects troop morale was motivating. It inspired me and now fuels a deep personal drive to understand the intricacies of this art and how to make the small things better for others.

Finally, I would like to thank my family for their support during the development of this thesis. Many long nights and odd timed meals made this possible. I am much stronger with your support and I make the best Kool-Aid.

TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	iii
ABSTRACT.....	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS.....	vi
ACRONYMS.....	viii
ILLUSTRATIONS	ix
TABLES	x
CHAPTER 1 INTRODUCTION	1
The Question.....	1
Purpose.....	1
Background.....	2
Assumptions.....	8
Definitions	9
Limitations	11
Delimitations.....	12
Scope.....	12
Significance of Study.....	13
CHAPTER 2 LITERATURE REVIEW	16
Introduction.....	16
Hurricane Katrina Specific Reviews.....	16
Haiti Earthquake Specific Reviews	18
Other Alternative Considerations	21
CHAPTER 3 RESEARCH METHODOLOGY	25
Introduction.....	25
Design Methodology.....	25
Design Strategy.....	26
CHAPTER 4 ANALYSIS	31
Introduction.....	31
Explanatory Analysis	35

Exploratory Analysis	41
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	50
Introduction.....	50
Conclusion	50
Recommendations.....	51
Suggestions for Future Research	52
APPENDIX A ILLUSTRATIONS OF RATION TYPES	54
APPENDIX B U.S.C.G. CERTIFICATE OF APPROVAL.....	56
BIBLIOGRAPHY	58
DISTRIBUTION LIST	63

ACRONYMS

AAR	After Action Review
DGDP	Directorate of Graduate Degree Programs
DHS	U.S. Department of Homeland Security
DOD	U.S. Department of Defense
DOS	U.S. Department of State
ERBAR	Emergency Ration Bar
FEMA	Federal Emergency Management Agency
GDP	Graduate Degree Programs
HDR	Humanitarian Daily Ration
MRE	Meals, Ready-To-Eat
NORTHCOM	United States Northern Command
SGA	Small Group Advisor
SRBAR	Survival Ration Bar
SOUTHCOM	United States Southern Command
USAID	United States Agency for International Development
USCG	United States Coast Guard

ILLUSTRATIONS

	Page
Figure 1. Katrina victims at Astrodome	5
Figure 2. National Guard Feeds Refugees.....	7
Figure 3. Feeding Quantities By Palletized Rations.....	34
Figure 4. Projected Supply Costs of Alternative Rations Provided by FEMA	36

TABLES

	Page
Table 1. Unpopulated Basic Attribute Comparisons of MREs, HDRs, and SRBars	27
Table 2. Eight Principles of Sustainment as Defined in FM 4-0	29
Table 3. Populated Basic Attribute Comparisons of MREs, HDRs, and SRBar	32
Table 4. FEMA Response to Hurricane Katrina Comparing MREs, HDRs, and SRBars.....	35
Table 5. USAID Response to Haiti Comparing MREs, HDRs, and SRBars.....	38
Table 6. Potential Aircraft Reductions in Haiti earthquake Response.....	40
Table 7. Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0	42

CHAPTER 1

INTRODUCTION

We deal through the state of Louisiana to FEMA, and we're told it's all moving, and our response here locally is, "Well, that's great, but it ain't here." And we've got hungry people; we've got frustrated people; we've got angry people. You've got a real situation on your hands. And we can only do so much because we stocked for 60 hours . . . we had 60 hours' worth of resources that we had stored, but now we're out of it.

—Dr. Walter Maestri, Homeland Security Coordinator on Hurricane Katrina

[There are] no food, no water; I mean the bare necessities. Where are the policemen at? Where are the National Guard to control all this?

—Unknown victim of Hurricane Katrina

We need help. We have not eaten in like five days.

—Unknown victim of Hurricane Katrina

The Question

Can FEMA and USAID more efficiently provide feeding rations during Humanitarian Assistance / Disaster Relief (HA/DRs) operations by using high calorie survival bars in lieu of MREs and HDRs while saving time, money, and resources for improved future operations?

Purpose

The purpose of this study is to determine if FEMA and USAID can more efficiently provide feeding rations during Humanitarian Assistance/Disaster Relief (HA/DRs) operations by using high calorie survival bars in lieu of MREs and HDRs while saving time, money, and resources for improved future operations. The three rations are pictured in Appendix A and are shown as they would be consumed. The

background of this analysis is over the natural disaster response over the last ten years, a layout basic assumptions, a definition of terms germane to this research, and a description of limitations and delimitations of this study.

Background

The United States government tries to help whenever people are in need after a crisis occurs whether it is a humanitarian, natural environmental or national disaster. Death comes to those without food after a disaster of these types. Consider a cancer patient like Terri Schiavo died after less than two weeks without food.¹ Now, she was immobile and not in an austere environment. The sterile conditions of a hospital are nothing compared with being homeless or outdoors directly in the elements immediately after a tropical storm or hurricane of moderate magnitude. Although there are always exceptions, the consensus is that a healthy person can last about a week without food, but children are more vulnerable lasting for just a few days. In these scenarios, the most immediate need is the physiological nutritional requirements for survival: water and food. According to Abraham Maslow's Hierarchy of Needs, this basic need must first be met in order for a person to function beyond a physiological or primal state.² Therefore, providing sustenance is the most important supply item to be delivered in a timely matter and should be the number one priority for logistical planners. Disaster preparedness must consider both planned and unplanned events spanning environmental events like flooding, tornados, wildfires, and terrorist attacks. The National Response Framework outlines as a basic tenet that "incidents be managed at the lowest possible jurisdictional level and supported by additional capabilities when needed."³ FEMA constrains itself by providing self-sufficiency of water, food, and staffing of shelters for a minimum of 48

hours and reevaluating its processes every 24 hours thereafter.⁴ Under these guidelines, a local community like a village or township would be responsible for providing immediate aid until FEMA or other similar response agencies arrived to deliver resources. Knowing this, why were many images broadcast worldwide of a seemingly abandoned and hungry people in the aftermath of the United States' Hurricane Katrina in 2005? FEMA was criticized for its response when people were left for days without any food in Louisiana and other surrounding states as stockpiles were quickly depleted. People couldn't even walk along roads when a devastating Haitian earthquake in 2010 basically erased a country's infrastructure off the map. USAID and other international governmental relief programs were constantly trying to feed a population whose entire government and infrastructure were completely destroyed in the Caribbean. So the takeaway is - why are we unable to meet the most basic of needs to starving people? A two day supply of food may be exhausted quickly by underestimating populations and not be abundant enough if the road infrastructure is destroyed delaying back up support.

This debate of whether FEMA (domestic) and USAID (foreign) were timely in enough in feeding hungry people after a disaster comes down to how efficient and effective both organizations can eventually meet requirements. The nutritional value of two MREs or a single HDR meets the daily recommendation standard put out by the Department of Health and Human Services.⁵ So will multiple high calorie energy bars currently approved for use by the USCG like the ERBar or Datrex bar.⁶ The current certificates are depicted in Appendix B. Rations like this are designed for pilots or other ship based personnel thrown overboard from a ship providing a daily 800 calories with two bars over the course of three days.⁷ The survival ration bar value is not being utilized

to its full potential. This study seeks to use the entire ration in one day and determine its usefulness.

One problem is money. Governments and relief agencies are bound to fiscal limits. Both FEMA and USAID are subordinate organizations of Department of Homeland Security (DHS) and Department of State (DOS), respectively, and have budgets they operate under (unless increased by a Congressional vote when an unforeseen disaster occurs). Managing that money is made more difficult when one considers the inherent waste in the methodology that both FEMA and USAID operate under. The efficiency of FEMA and USAID organizations in field feeding could use some improvement. There are cost comparisons to be made between the different available rations that meet the minimum dietary requirements. These are simple numbers since a single MRE costs \$7, an HDR costs \$5, and multiple survival rations costs \$3.⁸ However, these same rations have varying caloric content and size attributes. If these rations have similar capability, there may be fiscal benefits for even a single day. Now consider the potential benefit of two days or even making a bar a replacement lunch meal over the course of a week. Money may be saved for other fiscal requirements associated with the disaster or put towards the next operation that needs to be conducted or preparing for future storms churning in the oceans approaching the United States. The money saved or wastefully expended in one operation can impact future responses. Internationally, USAID still supports Haiti more than 2 years after the 2010 earthquake with “infrastructure, food security, and health.”⁹ This is further exacerbated at the individual state economy level and what it is able to action versus what it wants to provide to its citizens. A perfect example is the summer of 2011 when FEMA requested

more money to meet requirements lingering from Hurricane Katrina which occurred over five years earlier.¹⁰ Reconstruction projects were postponed in some instances as FEMA prepared for new disasters.¹¹ Nutritional products are abundant; it is the distribution to those in need that is difficult. Of course, cost should not be a concern when life is in peril. Below is a picture of a shelter helping those affected by Hurricane Katrina in 2005.



Figure 1. Katrina victims at Astrodome

Source: Chris Carson, Hurricane Katrina refugees fill the Astrodome floor (UPI Photo, Houston, TX, 2 September 2005).

However, costs may be a factor as the United States plans on sending huge triwall of never-ending MREs or HDRs via CH-47 Chinook helicopters whenever a disaster occurs further exacerbating the logistical problem. Unfortunately, some tough decisions will be made with logistical limitations of disaster response. C-130s can unload numerous 463L pallets (if the runways even exist), but are limited to a finite number of airframes per day on the airfield. Sea-faring ships need to be able to dock to unload most shipping containers. If unable to dock, then naval vessels would need to launch helicopters off their ship decks like the CH-53E Skycrane able to lift 20 foot containers

or the even smaller UH-60 Blackhawk that can slingload much lighter operational loads. This point is that you can only provide so many cubic meters or pounds of product into a country with all your available assets. Logistical planners will have to determine how people can be assisted and operational planners will have to determine who will be assisted. Which city will one risk at the expense of another? Given weight constraints it makes the most sense to nourish the most people with a smaller product that can accommodate your mode of transport. Given financial constraints any cost benefit would allow more inexpensive products to be distributed to more people needing nutrition. A day's worth of MRE weighs 58 ounces, HDR 40 ounces, and a survival ration around 20 ounces.¹² A smaller packaged product would not only add to the number served, but also increase amounts delivered per mode of transportation affecting logistical planning.

A smaller, less tasty or palatable survival ration may have other unintended positive consequences. A common theme in Haiti was desperately hungry families, tired of literally sharing a few single beans and resorting to theft just to survive another day.¹³ Soldiers always trade MRE components, but what do you give your younger brother who is starving in front of you? You have to share what you have available and a dense calorie bar can more easily be broken in half to feed your brother. Precisely splitting an MRE or HDR is imprecise whereas a SRBar comes prepacked into six individual bars that can more easily be equally shared.¹⁴

Lawlessness can quickly escalate as early police indifference to food looting progressed into blatant robbery in Katrina.¹⁵ Criminality can go further as gangs sell stolen food from the black market.¹⁶ If providing food to everyone is the goal, why not

“flood the market” with the lower cost bars and decrease the illegal activity of selling rations?

Cultural sensitivity concerns must be addressed when responding to disasters. Some ration types use alcohol and meat products in their preparation. Other types do not include these ingredients and even come in kosher variants, thus allowing consumption by a wider population. Another factor of the ration types is that cultural considerations must be balanced against monetary and logistical qualities as sensitivity issues are valid. Below is a picture showing a pregnant woman who was issued a single MRE by a U.S. National Guardsman after Hurricane Katrina struck New Orleans.



Figure 2. National Guard Feeds Refugees

Source: Roger L. Wollenberg, (UPI Photo, New Orleans, LA, 2 September 2005). Deandra Simon, pregnant and already a mother of two, received an MRE and one bottle of water at the convention center in downtown New Orleans. Many people there have had little food or water for the last three days.

There are media implications during disaster operations that influence emergency field feeding that planners must consider. Media can broadcast images that show efficiencies and effectiveness simultaneously. Figure 2 shows the vulnerability of individuals that rely on support during a natural disaster. Government exists to help people who are not able to help themselves. When that government is unable to meet the basic needs of the people, then the people will lose faith in the government. A downward spiral may occur with the population not respecting law and order deciding to riot in order to demand more support. Although this may increase international support, it will also cast the incapable country in a negative light, potentially affecting long term economic stability or future investments. Responders must realize that the media can impact the U.S. government's response and how it may be interpreted by the public at large.

MREs and HDRs meet the current need, but with risks. Providing another type ration that is smaller, cheaper, and logistically more easily manageable may have value. Unapproved alternative rations already exist, but there are consequences or trade-offs that must first be deemed acceptable. This may mean adopting a more lenient policy allowing for less robust rations. This has not been demonstrated in U.S practice, yet it is a potentially beneficial alternative.

Assumptions

A key assumption is that ration bars could be an alternative for a short term of a week or less following a natural disaster. Using Haiti as an example, the Joint Force Commander needed a theater port opening capability as most Haitian ports were rendered unusable following a major earthquake event.¹⁷ A response from the U.S. government

and Other Government Agencies (OGAs) coupled with the military effort, should have been able to construct or adapt to a devastated environment after a few days of bringing in their full support capability. A second assumption is that the bar would have to be edible and tasty. If no one is willing to eat the ration provided, then the option is worthlessly ineffective. However, the flavoring should not be a major concern when it is the only alternative to starvation. Another assumption is that a ration bar could be edible across different health or dietary constrained populations. For example, diabetics or those with high cholesterol could ingest the bars for about a week without adverse health effects. Another assumption is that instructions would be given or be printed on packaging similar to current MRE and HDRs so that people would not consume more than the recommended dosages. This is important as rationing works only as long as directions are followed.

Definitions

Terms defined as part of this thesis are described below. These are the manner in which these terms are used within the context of this thesis. They may include organizations actively depicted in this thesis.

Emergency Ration (ER) BAR. A caloric dense cereal bar individually wrapped and used strictly for short-term survival whose consumption helps minimize negative metabolic effects of acute starvation commonly and are used by the USCG to sustain one person for 3 days (using 2 bars per day at 400 calories each for a daily intake of only 800 calories) who must abandon ship; DLA named products is Food Packet, Survival, Abandon Ship.¹⁸ Datrex and Mainstay are similar survival ration products. See SRBar below.

Federal Emergency Management Agency (FEMA). A U.S. government agency that responds to natural disasters (i.e., hurricanes, earthquakes, tornados) and manmade disasters (i.e., wildfires, terrorism, hazardous material spills disasters) at the request of the Department of Homeland Security.¹⁹

Humanitarian Assistance/Disaster Relief (HA/DR). An author adaptation from JP 3-07.6 removing foreign from HA and DR definitions.²⁰ HA is a Department of Defense mission that relieves or reduces the impacts of natural or manmade disasters including other endemic conditions such as human suffering, disease, or privation that might present a serious threat to life or loss of property. DR is any prompt aid that can be used to alleviate the suffering of foreign disaster victims.

Humanitarian Daily Ration (HDR). Similar concept of MRE; composed of ready-to-eat thermo stabilized entrees and complementary components designed to provide a full day's sustenance to a moderately malnourished individual.²¹

Meals Ready to Eat (MRE). A self-contained operational ration consisting of a full meal packed in a flexible meal bag; designed to sustain an individual engaged in heavy activity such as military training or during actual military operations when normal food service facilities are not available.²²

Nutritional Unit (NU) or Recommended Daily Allowance (RDA). The amount of sustenance required for one person for one day maintaining normal homeostasis; 2,200 calories will be the norm in this thesis.²³

Survival Ration Bar (SRBar). A densely packed, high caloric bar that meets the basic nutritional requirements or the Recommended Daily Allowance (RDA). Multiple survival rations are available commercially off the shelf including a Defense Logistics

Agency version, the “Survival, Abandon Ship.” For the purposes of this thesis, an average cost, weight, shelf life, storage temperature limitations, and nutritional value was calculated so as to remain objective and not endorse a particular survival bar ration. Data was combined from three ration types randomly sampled including the ERBar, Mainstay, and Datrex. As designed, all three sampled bars that represent the SRBar, all contain six individual bars of 200 calories each that make a total 2,400 calorie package to be consumed over the course of three days. However, this thesis intends to use the SRBar product as a single day use not as originally designed.

Troop Issue Subsistence Activity (TISA). A Department of Defense term referring to a supply warehouse that maintains stocks of various ration types.²⁴

United States Agency for International Development (USAID). An independent U.S. government agency that supports long-term, equitable growth and advancement of US foreign policy objectives accomplished through guidance of the Department of State via economic growth, agriculture and trade, global health, democracy conflict prevention, and humanitarian assistance.²⁵

Limitations

This thesis considers only three ration types; the MRE, HDR, and a generic survival ration bar, referred to as a SRBar (similar to the USCG approved ERBar and Datrex contracts). A picture of each of the three ration types unpackaged into a single daily serving can be seen in Illustrations 1 through 3 of Appendix A. These three rations offer three variables that meet minimal dietary requirements that could be used in disaster operations. The Defense Logistics Agency (DLA) has a multitude of operational ration types and it is necessary to limit this study to like capabilities.²⁶ This thesis was unable to

locate satisfactory surveys denoting the quality of provided rations in a disaster response operation. Rather it was the response timeframe and delays in food delivery and distribution that were most condemned in AARs following Hurricane Katrina in 2005 that this research will consider in depth.²⁷

Delimitations

Since this thesis looks solely at natural disasters from 2001 to 2011, it is important to note that manmade disasters will not be considered. This distinction is important as the U.S. Government forecasts the use of relief supplies during hurricane season, yet has rarely needed to or been able to preposition supplies for a catastrophic event such as the attacks on the World Trade Center or Pentagon in 2001. Ration types can be used across any event and this thesis will not look at terrorism as a criteria. Also not considered is the High Energy Biscuit (HEB) as provided by the United Nations' World Food Programme. A picture of this ration is shown in Illustration 4 of Appendix A. This ration is left out of this study since only an approved U.S agency ration type for domestic consumption (such as the MRE, HDR and similarly USCG approved ERBar or Datrex type survival ration bar) are accepted.

Scope

This thesis considers United States governmental responses from natural disasters affecting the Americas in the last decade through today. All ration prices are effective as of Fiscal Year 2011 (October 2010) from Defense Supply Center Philadelphia's Directorate of Subsistence who "serves as the key link between the Armed Forces and the U.S Food Industry."²⁸

Significance of Study

This thesis seeks to improve the efficiency and volume of feeding populations left hungry from a natural or manmade disaster. If findings reveal that high calorie survival bars are an alternative to MREs or HDRs, it could dramatically affect U.S. Department of State and Department of Defense policy and practice during HA/DR operations. Fiscal costs could drive markets to produce smaller and cheaper products for DLA to manage. Additionally, the DOD and DOS may incur increased capability through saved dollar efficiencies during HA/DR operations which could provide a greater scope of mission after meeting sustenance requirements. Any reduction in sizing or packaging could directly affect U.S. Army logistical branches and USTRANSCOM delivery capabilities given their mission to move supplies, equipment, and personnel. This could allow those organizations to shift to lower priorities for movement faster than existing arrangements.

¹Ninette Sosa, Bob Franken, Rich Phillips, and Susan Candiotti, "Terri Schiavo has died," *CNN*, 31 March 2005, <http://www.cnn.com/2005/LAW/03/31/schiavo/index.html> (accessed 23 September 2011).

²Abraham, H Maslow, "A Theory of Human Motivation," *Psychological Review* 50 (1943): 370-396.

³U.S. Department of Homeland Security, *National Response Framework*, 10 January 2008, <http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf> (accessed 3 January 2012).

⁴U.S. Department of Homeland Security, "Target Capabilities List: A Companion to the National Preparedness Guidelines," September 2007, <http://www.fema.gov/pdf/government/training/tcl.pdf> (accessed 4 December 2011), 498-504.

⁵U.S. Department of Health and Human Services, *A Healthier You*, 2005, <http://www.health.gov/dietaryguidelines/dga2005/healthieryou/html/chapter4.html#4> (accessed 20 November 2011).

⁶QuakeKare USCG Certification, http://www.quakekare.com/emergency-supplies-kits/USCG_ER_Bar_2400_Cert.pdf (accessed 20 November 2011); Datrex USCG

Certification, http://www.datrex.com/products.html?page=shop.getfile&file_id=227&product_id=1 (accessed 20 November 2011).

⁷Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, Survival, Abandon Ship, <http://www.troopsupport.dla.mil/subs/rations/Programs/survival/shipabt> (accessed 21 September 2011).

⁸Defense Logistics Agency, Troop Support Subsistence Website for Pricing, <http://www.troopsupport.dla.mil/subs/rations/prices.pdf> (accessed 21 September 2011).

⁹US Agency for International Development (USAID), Two year commemoration of the January 12, 2010, earthquake, <http://haiti.usaid.gov/issues/earthquake.php> (accessed 24 April 2012).

¹⁰Brian Naylor, “New Storms, Prior Disasters Burden FEMA's Budget,” *National Public Radio*, <http://www.npr.org/2011/06/06/136991203/new-storms-prior-disasters-burden-fema-s-budget> (accessed 23 September 2011).

¹¹Ibid.

¹²Ralph Laurie, Defense Logistics Agency Liaison Officer to USNORTHCOM, Email correspondence, 6 September 2011.

¹³Damien Cave, “Fighting Starvation, Haitians Share Portions,” *New York Times*, 25 January 2010, <http://www.nytimes.com/2010/01/26/world/americas/26hunger.html> (accessed 23 September 2011).

¹⁴Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, Survival, Abandon Ship, <http://www.troopsupport.dla.mil/subs/rations/Programs/survival/shipabt> (accessed 21 September 2011).

¹⁵Associated Press, “Clash of desperation, lawlessness in storm’s wake raises ethical questions,” 1 September 2005, http://www.msnbc.msn.com/id/9160453/ns/us_news-katrina_the_long_road_back/t/city-without-rules-looting-ok/ (accessed 23 September 2011).

¹⁶Ibid.

¹⁷LTG P.K. Keen, LTC Matthew G. Elledge, LTC Charles W. Nolan, and LTC Jennifer L. Kimmey, “Foreign Disaster Response: Joint Task Force-Haiti Observations,” *Military Review* (November-December 2010): 88, http://usacac.army.mil/CAC2/MilitaryReview/Archives/English/MilitaryReview_20101231_art015.pdf (accessed 20 January 2012).

¹⁸Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, Survival, Abandon Ship, <http://www.troopsupport.dla.mil/subs/rations/Programs/survival/shipabt> (accessed 21 September 2011).

¹⁹Federal Emergency Management Agency (FEMA), “About FEMA,” <http://www.fema.gov/about/index.shtm#4> (accessed 23 September 2011).

²⁰U.S. Department of Defense, Joint Publication 3-07.6, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance* (Washington, DC: Government Printing Office, August 2001), vii and I-3.

²¹Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, HDR, <http://www.troopsupport.dla.mil/subs/rations/programs/hdr/hdrabt.asp> (accessed 21 September 2011).

²²Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, MRE, <http://www.troopsupport.dla.mil/subs/rations/programs/mre/mreabt.asp> (accessed 21 September 2011).

²³U.S. Department of Health and Human Services, *A Healthier You*, 14-17, <http://www.health.gov/dietaryguidelines/dga2005/healthieryou/html/chapter4.html#4> (accessed 20 November 2011.)

²⁴U.S. Department of the Army, Field Manual 10-23, *Basic Doctrine for Army Field Feeding and Class I Operations Management* (Washington, DC: Government Printing Office, 18 April 1996).

²⁵US Agency for International Development (USAID), “About USAID,” http://www.usaid.gov/about_usaid/ (accessed 23 September 2011).

²⁶Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, <http://www.troopsupport.dla.mil/subs/rations/programs/index.asp> (accessed 21 September 2011).

²⁷U.S. Department of Homeland Security, “The Federal Response to Hurricane Katrina Lessons Learned,” February 2006, 56, <http://emergency.cdc.gov/disasters/hurricanes/katrina/pdf/katrina-aar.pdf> (accessed 20 November 2011).

²⁸Defense Logistics Agency, Troop Support Subsistence Website for Ration Pricing, <http://www.troopsupport.dla.mil/subs/rations/prices.pdf> (accessed 21 September 2011).

CHAPTER 2

LITERATURE REVIEW

Introduction

The literature review describes the historical processes others have experienced or learned from previously. These experiences identify both areas of success and failure based on actions and inactions. Ultimately, these experiences are written or expressed for others to learn from and set the scene for further examination allowing the development of countermeasures for continual improvement. Hurricane Katrina impacted the gulf coast of the United States in 2005 and fostered some improvements in Operation Unified Response in Haiti through lessons learned.¹

Hurricane Katrina Specific Reviews

Hurricane Katrina was a powerful Category 5 storm that devastated the southeastern states along the Gulf of Mexico in 2005.² Having seen the aftermath of Hurricane Katrina, the President of the United States directed FEMA to immediately provide national disaster response operations to the area.³ According to a June 2006 After Action Review, the medical community identified several food related issues.⁴ The Mississippi Department of Health reported that “lack of food, supplies, water, and staff decreased the standard of care in the first days” and there was no “mechanism to utilize available stocks in community warehouses that could have been used for mass feeding at the local level.”⁵ Food storage was a key area that needed improvement.⁶ The common theme was the need to “preposition [of food supplies] to accelerate arrival time” at the state and federal levels.⁷ At the state level, the report identified required improvements in

“controlling and documenting food resource movements and locations.”⁸ A majority of the resource distribution and logistics potential solutions recommended a need to pre-plan centralized staging and pre-staging centers.⁹ Other conclusions included that there were “outbreaks of gastrointestinal illness attributed to unsafe food.”¹⁰ Also, critical infrastructure was determined vulnerable as healthcare facilities requested more funding to provide for the maintenance and upkeep of generators and the stockpiling of fuel, food, and water.¹¹

There were common themes identified by the Center for Disease Control (CDC) where their “volunteer teams must be self-sufficient (food, water, fuel, communications, etc.) or they will be a burden on the state receiving their assistance.”¹² “Some teams had a re-supply chain stretching back to their own state in order to keep teams self-sufficient; non self-sufficient teams often did more harm than good.”¹³ The CDC also found environmental health issues related to food safety as a result of unsafe food handling practices found.¹⁴ This demonstrates that fresh food supply comes with several additional requirements that will be competing for resources and may cause more harm if not prepared properly. Although all rations discussed so far have similar benefits in storage, they are vulnerable to common contamination or vectors if not handled appropriately. Rations that possess a longer self-life and are more resistant to extreme temperatures can be better suited to feeding a population in health jeopardy as a result of food shortages.

Lessons learned from natural disasters from years 2000 to 2010 have repeatedly identified prepositioning as a key to successful disaster response when timely delivery can be critical. Legislation such as the Post-Katrina Emergency Management Act passed in 2006, placed FEMA under the Department of Homeland Security, essentially

increasing capability and authorities to more quickly respond to disasters.¹⁵ FEMA Chief Administrator Craig Fugate testified to the House Homeland Security Subcommittee on Emergency Preparedness, Response, and Communications, stating that “federal disaster response officials are being trained to leap into action without always waiting for a governor or the President to declare a disaster.”¹⁶ This was a lesson learned in the Katrina After Action Report and was incorporated prior to the Hurricane Irene of 2010 response that spanned the Caribbean across the U.S. Atlantic coast and into Canada.¹⁷ Prepositioning personnel and resources prior to hurricane force storms reaching landfall greatly increased responsiveness to the effected regions such that “state, tribal, territorial and local officials consistently reported no unmet requests.”¹⁸ The quick response time was ultimately due to prepositioning.

Haiti Earthquake Specific Reviews

When a 7.0 earthquake shook Haiti in 2010, the United States military executed Operation Unified Response meant to provide a joint, interagency, intergovernmental, and multinational support.¹⁹ One of the primary units responding to the SOUTHCOM mission was the 7th Sustainment Brigade (SB) who provided sustainment support in the immediate aftermath.²⁰ 7th SB’s identified several logistical lessons learned in one of their After Action Reviews (AAR). Initially, ground transportation networks in Haiti were found to be unusable.²¹ Over time, the road networks became moderately usable only after huge efforts to remove obstacles and improve any available roads that still existed.²² Some roads were nonexistent.²³ All terrain trucks proved to have more maneuverability and could more easily pass obstacles while commercial trucks proved less effective. Since the Haitians’ homes were reduced to rubble making them unsafe to

even sit it, displaced people began to live on the undamaged road sections making them impassable to wheeled vehicles.²⁴ Displaced and hungry people would congregate outside bulk food locations and attempt to steal products from the moving trucks.²⁵ Some looters injured themselves or others when they fell off these moving vehicles.²⁶ This looting was made easier when vulnerable trucks had to slow down to a crawl, maneuvering around people living on streets. Once cargo truck transportation assets departed the bulk distribution centers, they were committed on assigned tasks longer than anticipated because of the unreliable, obstacle strewn road networks.²⁷ A lesson learned is that having prepositioned stocks in city centers would reduce the immediate need for transportation assets to be on roads that first had to be cleared and rendered safe for passage.²⁸

The 530th Combat Sustainment Support Battalion (CSSB) was a subordinate organization of the 7th SB.²⁹ In their AAR, they determined that Movement Control Teams (MCTs) were a critical capability that was needed.³⁰ Having them available would have “ensure[d] optimization of strategic mobility assets, streamlined routine and emergency sustainment operations, and maintained continuous and accurate visibility of personnel and cargo at all levels.”³¹ The implication is that logistical food supplies inundated the distribution systems. Using a smaller ration that can be more easily transported and offloaded may affect efficiencies within the distribution system. These concepts are echoed in USAID’s own report where it highlighted emergency food assistance and relief supply efforts to date.³² The fact sheet states that the United Nation’s own World Food Program (WFP) “reports that 95 metric tons of high-energy biscuits (HEBs) are currently available in Haiti, and WFP is working to distribute the HEBs to

affected populations.”³³ According to the WFP, the HEBs “contain vitamins, minerals and other micronutrients along with a dose of energy, which helps give disaster victims the strength they need to steer through the crisis.”³⁴ The HEB ration is a more minimalist ration providing only 450 calories at 10 percent protein.³⁵ Although HEBs are less nutritious than survival ration bars, it is a perfect example by the World Food Programme using alternative rations which it had done in previous missions in Africa. A picture of the HEB is depicted in Illustration 1 of Appendix A. USAID continued with the status quo when on “January 18, DOD approved transfer to Haiti of 16 million U.S. Meals Ready-to-Eat (MREs),” but needed to ship them to Haiti which would have taken time not available.³⁶ USAID is yet to employ this internationally recognized practice that works. USAID even highlighted how the DOD used aircraft with “C-17 air-delivered 14,500 MREs and 15,000 liters of water into a controlled drop zone” in close proximity to the capital airport in Port-au-Prince.³⁷ When using aerial delivery as a distribution method, pallet positions become extremely valuable. The efficiency of smaller rations would not only impact how many rations the logistical system and planner could move, but also how many more people can be nourished on SRBar pallets versus MRE pallets. Aerial delivery may significantly reduce looting or rioting crime by quickly delivering supplies to people on the ground in need.³⁸ By airdropping food supplies, aerial delivery may also significantly reduce congestion on roads network due to not needing to be driven on, at airports due to not landing, and at seaports that may be rendered unusable because of destroyed infrastructure.³⁹ Aerial delivery gives seaports and airports time to reopen which increases the amount of aid able to enter the operational area once operating at full capacity.⁴⁰

Other Alternative Considerations

The discussion must include other factors that pertain to non-fresh food sources of MREs, HDRs or survival ration bars (SRBars). A Disaster Medical Assistance Team (DART) operating in the New Orleans Airport reported in its own AAR that “Forest Service catering provided a large boost to morale and nutritional needs (especially sack lunches and coffee for the night shift).”⁴¹ The DART AAR continued and recommended “while the team could have subsisted on MREs for the deployment duration, morale would have been definitely impacted.” This is important to note that although the rations meet the initial requirement, they cannot be relied on for long duration as their use fails to meet the greater psychological needs of comfort over time.

Media implications of using survival ration bar type rations instead of MREs or HDRs may have negative publicity consequences. However, those negative aspects can be mitigated by writing and delivering the script ahead of the occurring operations. A guest speaker at the Command and General Staff College (CGSC) talked about using social media towards achieving objectives.⁴² Specific examples included writing the media engagements of the first Gulf War two months prior to the liberation of Kuwait.⁴³ The key take away is to tell the story of the operation early because it is difficult to understand the rationale behind higher feeding numbers and statistics in lieu of more robust food options. The media plan for using survival ration bars (SRBars) in lieu of MREs or HDRs is that although it is not the best support out there, it can sustain more people for a longer duration. Though this can be considered positive, it may foster negative connotations of simply receiving a candy bar.

¹U.S. Department of Homeland Security, “The Federal Response to Hurricane Katrina Lessons Learned,” February 2006, 51-64, <http://emergency.cdc.gov/disasters/hurricanes/katrina/pdf/katrina-aar.pdf> (accessed 20 November 2011).

²Richard D. Knabb, Jamie R. Rhome, and Daniel P. Brown, “Tropical Cyclone Report,” National Hurricane Center, 10 August 2006, http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf (accessed 20 September 2011).

³CNN, “Bush signs \$10.5 billion disaster aid bill,” 3 September 2005, http://articles.cnn.com/2005-09-02/politics/katrina.congress_1_disaster-relief-pelosi-senate-building?_s=PM:POLITICS (accessed 20 September 2011).

⁴State of Mississippi, “Emergency Support Function 8 Health and Medical,” *Hurricane Katrina After Action Report and Recommendations*, 1 June 2006, http://msdh.ms.gov/msdhsite/_static/resources/1676.pdf (accessed 25 September 2011).

⁵*Ibid.*, 32.

⁶*Ibid.*

⁷*Ibid.*, 18,44.

⁸*Ibid.*, 18.

⁹*Ibid.*, 49.

¹⁰*Ibid.*, 56.

¹¹*Ibid.*, 66.

¹²Centers for Disease Control and Prevention, “Hurricane Katrina After Action Review,” *Coordinating Office for Terrorism Preparedness and Emergency Response*, <http://www.bt.cdc.gov/disasters/hurricanes/katrina/pdf/katrina-aar.pdf> (accessed 25 September 2011).

¹³*Ibid.*, 41.

¹⁴*Ibid.*, 42.

¹⁵U.S. Government Accounting Office, “Homeland Security: Preparing for and Responding to Disasters,” Testimony before the Subcommittee on Homeland Security, Committee on Appropriations, House of Representatives, 9 March 2007, <http://www.gao.gov/products/GAO-07-395T> (accessed 20 November 2011).

¹⁶Charles S. Clark, “FEMA chief says pre-staging is key to rapid disaster response,” *Government Executive*, <http://www.govexec.com/defense/2011/10/fema-chief-says-pre-staging-is-key-to-rapid-disaster-response/35241/> (accessed 27 October 2011).

¹⁷Ibid.

¹⁸Ibid.

¹⁹US Agency for International Development (USAID), USAID Fact Sheet #1, 13 January 2010, http://www.usaid.gov/locations/latin_america_caribbean/country/haiti/eq/documents/01.13.10-USAID-DCHAHaitiEarthquakeFactSheet01.pdf (accessed 20 September 2011).

²⁰Combined Arms Support Command (CASCOM), “R-CAAT Series, Summary of Observations, Insights, and Lessons (OIL),” 8 June 2010, https://webmail2.us.army.mil/iwc_static/layout/main.html?lang=en&16.01_221723 and <https://www.us.army.mil/suite/page/638703> (accessed 25 September 2011).

²¹Ibid.

²²Ibid.

²³Ibid.

²⁴Ibid.

²⁵Ibid.

²⁶Ibid.

²⁷Ibid.

²⁸Ibid.

²⁹Ibid.

³⁰Ibid., 36.

³¹Ibid.

³²U.S Agency for International Development (USAID), “Haiti Earthquake. Fact Sheet #6 Fiscal Year (FY) 2010,” 18 January 2010, 2, http://www.usaid.gov/our_work/humanitarian_assistance/disaster_assistance/countries/haiti/template/fs_sr/fy2010/haiti_eq_fs06_01-18-2010.pdf (accessed 26 September 2011).

³³Ibid.

³⁴World Food Programme, “High Energy Biscuits–Food For Emergencies,” 14 January 2010, <http://www.wfp.org/stories/high-energy-biscuits-food-emergencies> (accessed 1 December 2011).

³⁵World Food Programme, “High Energy Biscuits,” 11 December 2008, <http://www.wfp.org/content/high-energy-biscuits> (accessed 1 December 2011).

³⁶*Ibid.*, 2.

³⁷*Ibid.*

³⁸Gordon Lubold, “Haiti earthquake: despite fears of rioting, US starts airdrops,” *Christian Science Monitor*, 19 January 2010, <http://www.csmonitor.com/USA/Military/2010/0119/Haiti-earthquake-despite-fears-of-rioting-US-starts-airdrops> (accessed 20 November 2011).

³⁹Larry Shaughnessy, “U.S. Air Force drops 55,000 pounds of food, water into Haiti,” *CNN*, 18 January 2010, http://articles.cnn.com/2010-01-18/world/haiti.airdrop_1_airdrop-haiti-water?_s=PM:WORLD (accessed 20 November 2011).

⁴⁰Jacqueline Charles, Lesley Clark, David Ovalle, and Carol Rosenberg, “New airfields, port reopening speed up aid to Haiti,” *Stars and Stripes*, 21 January 2010, <http://www.stripes.com/news/new-airfields-port-reopening-speed-up-aid-to-haiti-1.98284> (accessed 20 November 2011).

⁴¹Dr Helen Miller, Joel McNamara, and Dr Jon Jui, “Hurricane Katrina After Action Report,” *Disaster Medical Assistance Team-2 New Orleans Airport: August 31 to September 10, 2005*, 25 September 2005, <http://www.disastersrus.org/katrina/20051209101252-51802.pdf> (accessed 25 September 2011).

⁴²John Rendon, CGSC ILE 12-01, Guest Speaker Series, 20 September 2011.

⁴³*Ibid.*

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This thesis used case studies to evaluate FEMA and USAID's nonuse of emergency ration bars during natural disasters and how alternative rations may have improved response time while saving money and allowing quicker transportation of relief supplies following Hurricane Katrina in 2005 and a 7.0 magnitude earthquake to Haiti in 2010. This analysis describes the research design and strategy that led to evidence collection, which provided solid data for future analysis.

Design Methodology

This thesis followed mixed method designs described by Dr. John W. Creswell which included mixed method research designs that incorporate both qualitative and quantitative aspects.¹ Quantitative aspects identify numerical figures that answer questions of how many in order to describe relationships. The data collected "can be analyzed using statistical procedures."² The strength of quantitative design methodology is that it is a science of hard numbers and facts that produce data that can easily be analyzed. This is why costs in dollars, weights, and measures will be used to compare the different ration types. However a weakness in quantitative design is that there are contextual aspects that cannot easily be applied with raw numerical data. This was mitigated by balancing qualitative designs in the second half of the mixed methodology. Qualitative aspects identify natural factors that answer questions of why or purpose in order to describe relationships. Dr. Creswell further explains that the data collected is

then analyzed “building from particulars to general themes . . . making interpretations of the meaning of the data.”³ A particular strength of qualitative design that pertains to this thesis is that complex theory constructs can be defined and valued against known ideas. U.S. Army sustainment doctrine was chosen to evaluate the different ration types as it framework familiar to military logisticians. A weakness of qualitative design is that personal biases can influence the study. To mitigate this weakness, the thesis used current joint doctrine that applies to all branches of military service as much as practicable. Joint Publication 4-0 exactly matches four of the eight sustainment principles and closely matches the remaining principles.⁴ Additionally the quantitative and qualitative aspects of this mixed methodologies approach balance the strengths of each methodology and mitigate the other methodology’s weaknesses.

Design Strategy

This thesis followed two mixed method strategies described by Dr. John W. Creswell; first, the sequential explanatory strategy and secondly the sequential exploratory strategy. Sequential explanatory strategies collect and analyze “quantitative data in the first phase of research followed by the collection and analysis of qualitative data in a second phase that builds on the results of the initial quantitative results.”⁵ The sequential explanatory strategy investigated raw attributes of each ration type in order to analyze its meanings.

Sequential exploratory strategies collect and analyze qualitative data in the first phase “followed by a second phase of quantitative data collection and analysis that builds on the results of the first qualitative phase.”⁶ The sequential exploratory strategy

investigated U.S. Army doctrinal attributes of each ration type assigning values to their qualities in order to interpret the results. These strategies are further described below.

The sequential explanatory strategy starts by identifying efficiencies of the different ration types from the two case studies of Hurricane Katrina and the Haitian earthquake. This design depicted how alternative rations that are more cost effective would benefit the taxpayer. First, basic raw data needed to be compiled about the specific ration types and is depicted in Table 1: Unpopulated Basic Attribute Comparisons of MREs, HDRs, and SRBars.⁷

Table 1. Unpopulated Basic Attribute Comparisons of MREs, HDRs, and SRBars			
Variables	MRE* (expended per day)	HDR	Survival Ration** (consuming 6 bars daily)
Rations Per Day			
Cost Per Ration			
Calories			
Protein, Fat, Carb Mix			
Weight Per Ration			
Storage Temp			
Shelf Life			
Pallet Weight (48x40)			
Pallet Feeds (48 x 40)			

Source: Created by author with DLA representative, Ralph Laurie.

* 2 MREs are required to meet Recommended Daily Intake (RDA) as per Department of Health and Human Services.

** The SRBar contains 6 bars of 400 calories each so an entire package must be consumed to meet Recommended Daily Intake (RDA) as per Department of Health and Human Services.

Data obtained from a populated table 1 will be extrapolated to form fiscal supply costs and quantifiable comparisons applied to depict amount of meals consumed and at what cost. This data has quantitative value when applied to historical facts and figures. It will be further analyzed in chapter 4 to determine either positive or negative benefits.

Secondly, a logistical comparison of the same case studies analyzed if the smaller ration type could be distributed more efficiently to affected populations. This analysis will include logistical assets required and pallet positions saved given any supply cost benefits. This analysis considers supply cost benefits and only predicts further additional savings from transportation reductions associated with fuel consumption, manpower operating distribution assets, or maintenance costs that would increase any benefits already related to the supply costs.

The sequential exploratory strategy starts by identifying the qualities applied by the U.S. Army's approved sustainment doctrine to the three rations types studied - an MRE, HDR, or SRBar—to determine which rations best meet model standards. Field Manual (FM) 4-0 was used for this purpose as the U.S. Army's baseline document for sustainment across the full spectrum of operations for Active Component Soldiers, National Guard, and Army Reserves. FM 4-0 lists the principles of sustainment and how they “are essential to maintaining combat power, enabling strategic and operational reach, and providing Army forces with endurance.”⁸ During a Humanitarian Assistance/Disaster Relief operation, this thesis calculated which ration choices best met each of the eight principles of sustainment: integration, anticipation, responsiveness, simplicity, economy, survivability, continuity, and improvisation.⁹ Each principle is militarily generic and had to be interpreted in how it would be applied into a

humanitarian assistance or disaster relief operation. Data detailing each principle is depicted in table 2: Eight Principles of Sustainment as Defined in FM 4-0.¹⁰ A decision matrix will be created to graphically depict rankings that meet the U.S Army’s definition of the principles of sustainment and is shown in chapter 4 via table 5.

Table 2. Eight Principles of Sustainment as Defined in FM 4-0	
Integration	Joins all of the elements of sustainment (tasks, functions, systems, processes, and organizations) to operations assuring unity of purpose and effort.
Anticipation	Ability to foresee events and requirements and initiate necessary actions that most appropriately satisfy a response.
Responsiveness	Ability to meet changing requirements on short notice and to rapidly sustain efforts to meet changing circumstances over time.
Simplicity	Relates to processes and procedures. Unnecessary complexity of processes and procedures compounds the confusion. Simplicity fosters efficiency throughout the operations process and allows for more effective control of sustainment.
Economy	Providing sustainment resources in an efficient manner to enable a commander to employ all assets to generate the greatest effect possible.
Survivability	Ability to protect personnel, information, infrastructure, and assets from destruction or degradation.
Continuity	Uninterrupted provision of sustainment across all levels of [operation] war.
Improvisation	Ability to adapt sustainment operations to unexpected situations or circumstances affecting a mission.

Source: Created by author based on U.S. Department of the Army, Field Manual 4-0, *Sustainment* (Washington, DC: Government Printing Office, 30 April 2009).

This research methodology provides a thorough analysis as to whether HA/DR feeding can be improved. This thesis incorporates statistics from actual events and applies U.S. Army doctrine as a theoretical template. The results may highlight areas of waste and finds solutions that not only benefit those on the ground in need, but could redefine intergovernmental agency policy objectives.

¹John Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Thousand Oaks, CA: Sage Publications, 2009), 4.

²Ibid.

³Ibid.

⁴U.S. Department of Defense. Joint Publication 4-0, *Joint Logistics* (Washington DC: Government Printing Office, 18 July 2008), xvi-xvii.

⁵Ibid., 211.

⁶Ibid.

⁷Author source, Table 1: Unpopulated Basic Attribute Comparisons of MREs, HDRs, and SRBars

⁸U.S. Department of the Army, Field Manual 4-0, *Sustainment* (Washington, DC: Government Printing Office. 30 April 2009), 1-1 to 1-4.

⁹Ibid.

¹⁰Created by author based on Field Manual 4-0, dated 30 April 2009, Table 2: Eight Principles of Sustainment as Defined in FM 4-0.

CHAPTER 4

ANALYSIS

Introduction

This research was conducted to determine whether FEMA and USAID could more efficiently provide feeding rations during Humanitarian Assistance / Disaster Relief (HADR) operations by using high calorie survival ration bars in lieu of MREs and HDRs and save time, money, and resources for improved future operations. In order to determine efficiencies, a sequential explanatory and exploratory analysis was conducted into each agency's response. This analysis is derived from the literature review and the raw data generated from the research design methodology.

Table 3. Populated Basic Attribute Comparisons of MREs, HDRs, and SRBar			
Variables	MRE* (expanded per day)	HDR	Survival Ration** (consuming 6 bars daily)
Rations Per Day	1 (2)	1	1
Cost Per Ration	\$7.20 (\$14.40)	\$4.65	\$3.00
Calories	1250 (2500)	2200	2400
Protein, Fat, Carb Mix	13%, 36%, 51%	11%, 29%, 60%	10%, 24%, 66%
Weight Per Ration	28 ounces (56 oz)	40 ounces	20 ounces
Storage Temp	80F maximum	80F maximum	-22F to 149F max
Shelf Life	3 years	3 years	5 years
Pallet Weight (48x40)	1098 pounds	1237 pounds	2340 pounds
Pallet Feeds (48 x 40)	576 meals per pallet	480 meals per pallet	1800 meals per pallet

Source: Created by author with DLA representative, Ralph Laurie.

* 2 MREs are required to meet Recommended Daily Intake (RDA) as per Department of Health and Human Services.

** The SRBar contains 6 bars of 400 calories each so an entire package must be consumed to meet Recommended Daily Intake (RDA) as per Department of Health and Human Services.

First, a sequential explanatory procedure started with raw data and is populated in Table 3: Basic Attribute Comparisons of MREs, HDR, and SRBars. This formed the foundation of further quantitative analyses of U.S. government agency response during the 2005 Hurricane Katrina in the United States and the 2010 Haitian earthquake.¹ Data was placed into table 4 and table 5, respectively. As reported by a Defense Logistical Agency representative in USNORTHCOM, DOD provided “2.1 million MREs to USAID at a cost of \$15 million dollars” and “FEMA distributed 26 million MREs during Hurricane Katrina at a cost of \$192 million dollars.”² There was necessary adjustments to figures in formulating the data as some ration types require multiple issues per day due to daily caloric requirements. Because the Department of Health and Human Services

recommends 2200 calories per day, then two MREs must be issued per day.³ The SRBar is designed to be consumed by a daily restriction of two individually wrapped bars for 800 calories giving 2400 total calories over the course of three days.⁴ This analysis mandates that the total SRBar ration package be consumed in one day in order to have all the ration types calorically equal for a fair comparison. Since the HDR and SRBar are issued at one per day levels, the hypothesized issue quantities must half the MRE totals.⁵ So for example, if the total amount of MREs issued by DOD to USAID during the 2010 Haiti earthquake response was 2,100,000, then the HDR and SRBar hypothesized issues would be 1,050,000 as they are one day ration types.⁶ Further, the MRE and survival ration bar split option quantities are reduced 25 percent to account for a meal option that meets the daily calorie total per half day.⁷ Another important factor out of this table was the determination that there was no significant statistical difference among the three ration types concerning nutritional value with content of protein, fat, and carbohydrate percentages.⁸ The SRBar had a benefit with greater tolerances allowing higher storage temperatures, but there was no conclusive data to compare on how lower temperatures affected the MRE and HDR options.⁹ The SRBar shelf life duration was greater than the MRE and HDR options.¹⁰ Weight benefits by ration type also favor the SRBar over the MRE, and to the HDR albeit to a lesser degree.¹¹ Further benefits concerning the ration types are depicted in Figure 3: Feeding Quantities By Palletized Rations.¹²

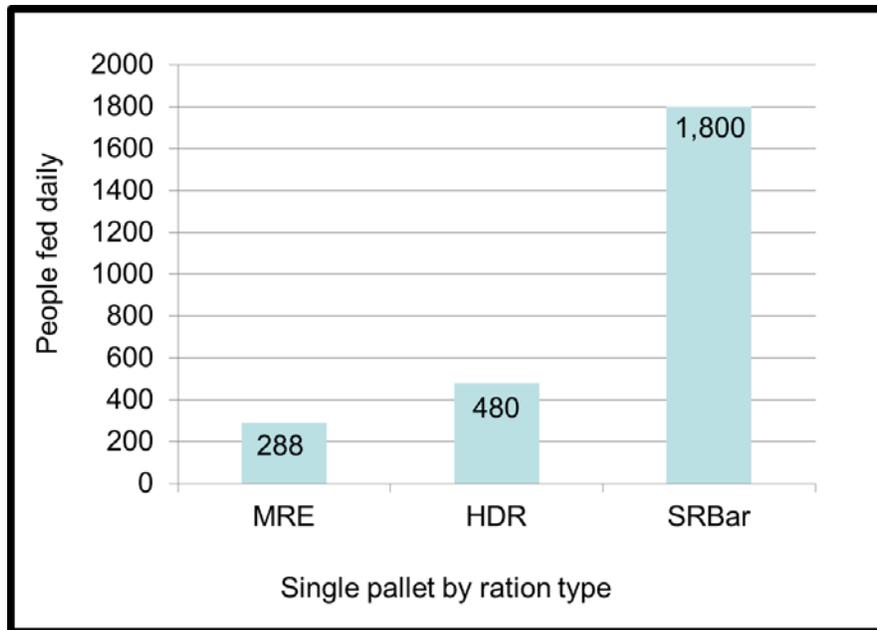


Figure 3. Feeding Quantities By Palletized Rations

Source: Created by author. Numbers of people fed change based on ration pallet received.

When available transportation assets are limited, then a ration type pallet that feeds more people should be utilized in order to preserve life or reduce as much human suffering as possible. This will be further explained in the formal sequential explanatory analysis

Secondly, a sequential exploratory procedure focused on qualitative analyses of both disasters response scenarios will be combined to populate data into a decision matrix in Table 7: Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0.¹³

Explanatory Analysis

The U.S. government directed FEMA to support disaster relief operations after Hurricane Katrina struck the southeastern United States in 2005 who provided 26 million MREs.¹⁴ The data was calculated and depicted in Table 4: FEMA Response to Hurricane Katrina Comparing MREs, HDRs, and SRBars.¹⁵

Table 4. FEMA Response to Hurricane Katrina Comparing MREs, HDRs, and SRBars							
FEMA and Hurricane Katrina	Total Rations Issued	Total Cost in Dollars	Cost Benefits in Savings	Total Weight (sTons)	Weight Benefit (sTons)	Total Pallet (48x40)	Pallet Benefit (48x40)
MREs @ \$7.20 weighing 28 oz	26,000,000 MRE	\$187,200,000	N/A	22,750	N/A	45,139	N/A
HDRs @ \$4.65 weighing 40 oz	13,000,000 HDR	\$60,450,000	\$126,750,000 saving 68%	16,250	6,500 saving 29%	27,084	18,055 saving 40%
If 50/50 Split MREs @ \$7.20 SRBars @ \$3.00	6,500,000 MRE 6,500,000 SRBar	\$46,800,000 <u>+\$19,500,000</u> \$66,300,000	\$120,900,000 saving 65%	5,688 <u>+ 4,063</u> 9,751	12,999 saving 58%	11,285 <u>+3,612</u> 14,897	30,242 saving 67%
SRBars @ \$3.00 weighing 20 oz	13,000,000 SRBar	\$39,000,000	\$148,200,000 saving 80%	8,125	14,625 saving 65%	7,223	37,916 saving 84%

Source: Created by author.

The data found that MREs were the most expensive feeding ration at over \$187 million dollars.¹⁶ Combining the MRE option with the SRBar to provide a one to one daily mixture proved to have a 65 percent cost benefit costing slightly over \$60 million dollars.¹⁷ The third best fiscal option was seen in the HDR only option with a cost savings of 68 percent costing slightly over \$66 million dollars and showing that the HDR is slightly cheaper than a fifty-fifty mixture.¹⁸ However, a pure SRBar option would have yielded an 80 percent cost saving at only \$39 million dollars.¹⁹ Fiscal benefits to supply costs are depicted in Figure 4: Projected Supply Costs of Alternative Rations.²⁰

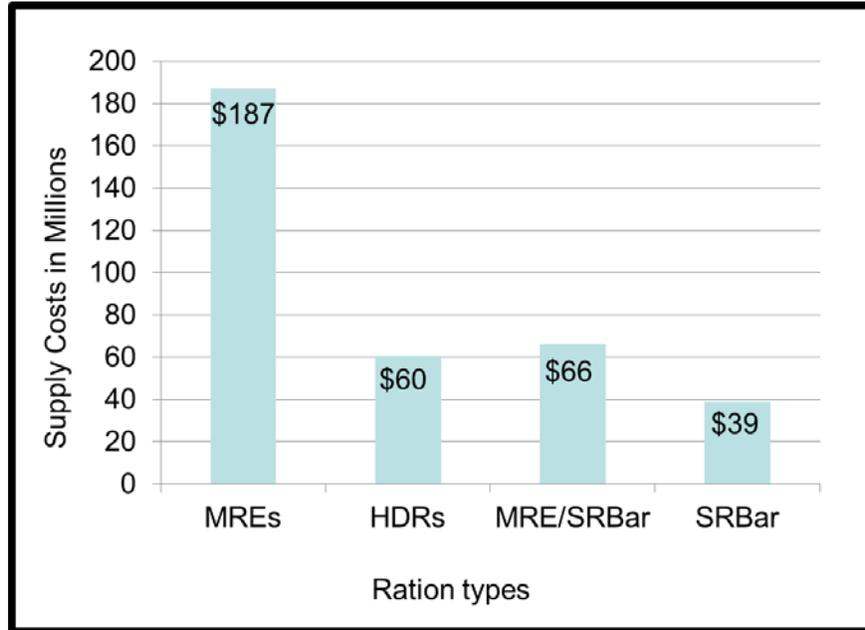


Figure 4. Projected Supply Costs of Alternative Rations Provided by FEMA

Source: Created by author. The supply costs change based on ration type FEMA issues.

FEMA would spend less in supply costs by issuing the alternative rations instead of the MRE.²¹ The most expensive only MRE option is three times as costly as the HDR or MRESRBar split option.²² The most beneficial supply cost is in the SRBar at 80 percent price reduction.²³ The importance of supply cost reductions is that the saved monies can then be applied to other endeavors meant to ease human suffering have a greater propensity to be actioned quicker.

There are similar benefits seen in the weight and volume aspects of these ration choices if applied to the Hurricane Katrina response model. The MRE pure option of disaster relief feeding was the heaviest at 22,750 short tons (ST).²⁴ The HDR pure option has a reduction of 6,500 short tons to 16,250 short tons decreasing weight requirements

by 29 percent.²⁵ The MRE and SRBar daily equal mixture reduced 12,999 short tons to 9,751 short tons decreasing weight requirements by 58 percent.²⁶ The lightest weight ration option was the SRBar pure solution which reduced 14,625 short tons to an 8,125 short tons requirement decreasing weight requirements by 65 percent.²⁷ A similar trend was seen in the total number of pallets required to move the ration choices. The MRE pure option requires 45,139 pallets to move 26 million rations for 13,000,000 daily meals.²⁸ The HDR pure option requires 27,084 pallets to move the 6,500,000 rations removing 18,055 pallet positions decreasing the movement requirement 40 percent.²⁹ A mixture of MREs and SRBar needed only 11,285 pallets removing 30,242 pallet positions and decreasing the movement requirement 67 percent.³⁰ The SRBar was once again the smallest requirement at only 7,223 pallets removing 37,916 pallet positions and decreasing the movement requirement 84 percent.³¹ So the bottom line once again is that the MRE option is neither cost beneficial nor logistically more efficient in weight or volume performing at the lowest level in all three categories. Although the HDRs are a slightly more cost effective option than a MRE pure option, they are much heavier and require more pallet positions to move than the MRE and SRBar mix. The SRBar was both the cheapest option weighing the least and requiring the least pallets to move.

The U.S government directed USAID to support disaster relief operations after a 7.0 magnitude earthquake struck Haiti in 2010.³² The data was calculated and depicted in Table 5: USAID Response to Haiti Comparing MREs, HDRs, and SRBars.³³

Table 5. USAID Response to Haiti Comparing MREs, HDRs, and SRBars							
USAID and Haiti Response	Total Rations Issued	Total Cost in Dollars	Cost Benefits in Savings	Total Weight (sTons)	Weight Benefit (sTons)	Total Pallet (48x40)	Pallet Benefit (48x40)
MREs @ \$7.20 weighing 28 oz	2,100,000 MRE	\$15,120,000	N/A	1,838	N/A	3,646	N/A
HDRs @ \$4.65 weighing 40 oz	1,050,000 HDR	\$4,882,500	\$10,237,500 saving 68%	1,313	525 stons saving 29%	2,188	1,458 saving 40%
If 50/50 Split MREs @ \$7.20	525,000 MREs	\$3,780,000	\$9,765,000 saving 65%	460	1,049 stons saving	912	2,442 saving
SrBars @ \$3.00	525,000 SRBar	<u>+\$1,575,000</u>		<u>+ 329</u>	57%	<u>+ 292</u>	67%
SrBars @ \$3.00 weighing 20 oz	1,050,000 SRBar	\$5,355,000	\$11,970,000 saving 80%	789	1,181 stons saving 65%	1,204	3,062 saving 84%

Source: Created by author.

The data found that MREs were the most expensive feeding ration at over \$15 million dollars.³⁴ Combining the MRE option with the SRBar to provide a one to one daily mixture proved to have a 65 percent cost benefit costing slightly under \$10 million dollars.³⁵ The third best fiscal option was seen in a HDR only option with a cost of \$4.8 million dollars yielding a savings of 68 percent saving slightly over \$10.2 million dollars.³⁶ This demonstrates that the HDR option is slightly cheaper than a fifty-fifty mixture.³⁷ However, a pure SR Bar option would have yielded an 80 percent cost saving of slightly over \$3 million dollars.³⁸ There are similar benefits seen in the weight and volume aspects of these ration choices if applied to the Haiti earthquake response model. The MRE pure option of disaster relief feeding was the heaviest at 1,838 short tons.³⁹ The HDR pure option has a reduction of 525 short tons to 1,313 short tons decreasing weight requirements by 29 percent.⁴⁰ The MRE and SRBar daily equal mixture reduced 789 short tons to 1,049 short tons decreasing weight requirements by 57 percent.⁴¹ The

lightest weight option for rations was the SRBar pure solution which reduced an additional 1,181 short tons to 657 short tons decreasing weight requirements by 65 percent.⁴² A similar trend was seen in the total number of pallets required to move the ration choices. The MRE pure option requires 3,646 pallets to move 2.1 million rations for 1,050,000 daily meals.⁴³ The HDR pure option requires 2,188 pallets to move the 1,050,000 rations removing 1,458 pallet positions decreasing the movement requirement 40 percent.⁴⁴ A mixture of MREs and SRBar needed only 1,204 pallets removing 2,442 pallet position loads decreasing the movement requirement by 67 percent.⁴⁵ The SRBar was once again the smallest requirement at only 584 pallets removing 3,062 pallet positions decreasing the movement requirement 84 percent.⁴⁶ So the bottom line is that MREs are neither the most cost beneficial nor logistically easier to move in weight or volume performing at the lowest levels in all three categories. Although the HDRs are slightly a more cost effective option than a MRE pure option, they are much heavier and require more pallet positions to move than the MRE and SRBar mix. The SRBar was both the cheapest option and weighing the least amount, requiring the least pallets to move.

The efficiency of a smaller and lighter ration can be further explained by showing the reduced number of aircraft required to move food to support a humanitarian crisis. Military air transportation planners primarily use the 463L pallet as a planning factor when loading aircraft.⁴⁷ A 463L pallet is 108 inches wide by 88 inches long and the standard warehouse wooden pallet is 48 inches wide by 40 inches long.⁴⁸ Therefore, the standard 463L pallet can carry four standard wooden pallets.⁴⁹ Typically the United States Air Force (USAF) fulfills the transportation requirement from Transportation

Command (TRANSCOM) with its C-130 Hercules that can move 6 total 463L pallets and its C-17 Globemaster aircraft that can move 18 total 463L pallets if properly configured.⁵⁰ Given that 2.1 million rations were used during the disaster response of the Haitian earthquake in 2010, the total air distribution benefits may prove significant.⁵¹ Results are depicted in Table 6: Potential Aircraft Reductions in Haiti earthquake response.⁵²

Type of Ration Options	Required Standard Pallets (48"x40")	Required 463L Pallets (108"x88")	Total C-130 Aircraft Required (6 pos)	Total C-17 Aircraft Required (18 positions)
MRE only	3646	912	152	51
HDR only	2188	547	92	31
MRE/ SRBar Mixture	1204	301	51	17
SR Bar only	584	146	25	9

Source: Created by author.

The MRE option requires 3,646 standard wooden pallets or 912 total 463L pallets to move the required 2.1 million rations which would require either 152 total C-130 aircraft or 51 total C-17 aircraft in order to support.⁵³ The HDR would require 2,188 standard pallets or 547 total 463L pallets to move rations requiring either 92 C-130 aircraft or 31 C-17 aircraft.⁵⁴ A mixture of MRE and the SRBar requires 1,204 standard pallets or 301 total 463L pallets to move their rations requiring either 51 C-130 aircraft or 17 C-17 aircraft.⁵⁵ The solely SRBar option would require 584 standard pallets or 146 total 463L pallets to move their rations requiring either 25 C-130 aircraft or 9 C-17

aircraft.⁵⁶ It is important to mention that not only are less assets being used consuming less fuel, there is a reduction in the amount of airspace and aircrews required. MOG refers to the maximum total amount of aircraft that an airfield is not allowed to be exceeded.⁵⁷ Airfield congestion was a major factor in the immediate response effort in Haiti where some aircraft carrying all kinds of different relief supplies were unable to land due to Maximum on Ground (MOG) restrictions. With less aircraft, airspace could be freed to bring in other assets such as medical or construction equipment that can make the transition to stability operations faster.

Exploratory Analysis

The qualitative analysis of both Hurricane Katrina in 2005 and the 7.0 earthquake that hit Haiti in 2010 were so similar in logistics principles that they were both used to populate Table 7: Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0. For the purposes of this analysis, each sustainment principle was subjectively ranked according to how well it met the U.S. Army's definitions during disaster relief operations of the two case studies. A value of "one" means a sustainment principle either did not apply or did not meet any of the criteria applicable to the sustainment definition. A value of "two" means a principle met some of the sustainment definitions, but was lacking in some aspect so that there could be improvements in how each ration type met requirements. A value of "three" means a principle met the sustainment definition, fulfilling most if not all the ration requirements intended. The principle values of each ration were compiled and a total value was produced. All the totaled values were compared to determine which ration best met the principles of sustainment.

Depicted below is Table 7: Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0.⁵⁸

Table 7. Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0			
8 Principles	MRE	HDR	SRBAR
Integration	2	3	1
Anticipation	2	2	3
Responsiveness	1	2	3
Simplicity	1	2	3
Economy	1	2	3
Survivability	2	2	3
Continuity	2	3	1
Improvisation	3	2	1
Total	14	18	18

Source: Created by author with data from Department of the Army, Field Manual (FM) 4-0, *Sustainment* (Washington, DC: Government Printing Office, 2009).

Note: Higher number is better and lower number is least favorable.

Integration of the ration types favor the HDR during disaster relief operations as the best method that meets the overall elements “tasks, functions, systems, processes, and organizations” of sustainment.⁵⁹ The HDR is approved for use by Defense Security Cooperation Agency-Humanitarian Assistance/Demining Activities (DSCA-HA/D). The HDR could more easily be expanded due to its prior familiarity and acceptance across other departments. The HDR is relatively religiously and culturally neutral containing no

alcohol, animal products or animal by-products. The MRE does not meet these same criteria, but does bring several of the aforementioned elements of sustainment. The SRBar is just too small a ration when compared to the capability of the other ration options, receiving the lowest possible value.

Anticipation of the ration types favor the SRBar because of its small size allows for higher levels of stockage located in several widely distributed centers across larger areas, yet still feed more people more cost effectively. The MRE and HDR tied in meeting anticipation criteria. The MRE does require more storage requirements, but it is produced in higher quantities making them more available in comparison to the HDR option. Most National Guard Centers maintain a unit stockage in their armories and their proclivity to respond to national disasters favors this ration type for domestic responses.

Responsiveness favors the SRBar because of its ability to feed 1,800 people per pallet of rations which is more than three times the number of people fed on the MRE at 576 and the HDR at 480.⁶⁰ The MRE has the least caloric density at 1250 per ration whereas the other two rations hover around the 2,400 calorie level.⁶¹ In addition, the SRBar received more consideration as it maximizes the aerial delivery of the A-22 Cargo Bag which contains a pallet dimension weighing out at 2,200 pounds.⁶² This is evident when aircraft capacity limits the number of airdrop loads on an aircraft. The volume and weight benefits allow the SRBar to be air dropped in the highest numbers.

Simplicity favors the SRBar as it is the easiest to store, move, issue, and manage. The SRBar also has a longer shelf life ration. The HDR is a slightly better option simply because it is half the size of the MRE daily requirement. Two pallets of MREs are required to feed the same amount of people as one pallet of HDRs which increases

storage and transportation requirements. A common theme after the Haiti earthquake in 2010 was family members sharing the few rations received.⁶³ Precisely splitting an MRE or HDR is difficult whereas a SRBar comes prepacked into six individual bars that can more easily be equally shared reinforcing the SRBar benefit over the MRE or HDR.⁶⁴

Economy favors the SRBar as it is the cheaper option at \$3 per ration while the HDR is slightly higher at \$4.65 per ration.⁶⁵ The MRE is the most expensive option at \$7.20 per ration and needs two in order to sustain the calories requirement.⁶⁶ Therefore, it actually costs \$14.40 per day to feed one person on MREs. This additional ration further exacerbates the transportation requirements. Supply cost savings are exacerbated by further reductions in transportation assets and crews not used to move smaller rations.⁶⁷

Survivability was interpreted as which ration type can last the longest in austere environments. Under this premise, survivability favors the SRBar because of temperatures and shelf life. The SRBar is rated from -22 to 149 degrees Fahrenheit for up to five years storage.⁶⁸ The MRE and HDR both require temperatures not to exceed 80 degrees Fahrenheit for up to three years storage. The MRE requires twice the amount of storage space versus HDRs and therefore require twice the amount of climate controlled or refrigerated space.⁶⁹ A single MRE also contains only half the calories of an HDR, so the space requires are doubly burdensome.

Continuity across all levels of operations favors the HDR because of its general acceptance among more governmental agencies and its religious and culturally neutral nature.⁷⁰ The MRE meets some agencies requirements and intent. The SRBar proved to be the least effective as it is a minimal in nature and should not be relied upon over long duration operations. However, due to the small size of the SRBar, aircraft MOG

restrictions may limit time and scope of disaster response operations, so the SRBar has some benefit.⁷¹ According to the USSOUTHCOM Commander General Douglas Fraser, airfield congestion caused delays of delivering humanitarian aid and supplies to the Haitian people after the earthquake in 2010.⁷²

Improvisation as a measure of adaption to situations favors the MRE solely because of the available menu options.⁷³ There are twenty four menus of the MRE.⁷⁴ Although the HDR has fifteen menus, many of the main entrees are closely duplicated so equal variance is not an accurate statement.⁷⁵ The SRBar proved to be the least favorable option as it is currently only available in a few flavors by most vendors, lemon-vanilla or coconut in the single option selected. It is hypothesized that affected populations would tire quickly from one flavored ration. The MRE and HDR options at least have the ability to trade menu to obtain a different flavor among them so people are more likely to satisfy their hunger to their individual taste. Supplements and additions like bread, cereal and milk would improve all ration types potentially detracting some of the adverse image of a one flavored SRBar.

As each principle of sustainment is rated and tallied in Table 7, a pattern emerged where the MRE is a poor choice of ration during disaster response operations receiving a rating of fourteen of the possible twenty-four available points. The HDR and SRBar tied at eighteen points out of the possible twenty-four available points. In summation, the SRBar and HDR best meet the quality analyses arena.

¹Created by author with DLA representative Ralph Laurie, Table 3: Populated Basic Attribute Comparisons on MREs, HDRs, and SRBars.

²Ralph Laurie, Defense Logistics Agency Liaison Officer (DLA LNO) to USNORTHCOM, email correspondence, 6 September 2011.

³U.S. Department of Health and Human Services, *A Healthier You*, Chapter 4, 14-17, 2005, <http://www.health.gov/dietaryguidelines/dga2005/healthieryou/html/chapter4.html#4>, (accessed 20 November 2011).

⁴Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, Survival, Abandon Ship, <http://www.troopsupport.dla.mil/subs/rations/Programs/survival/shipabt> (accessed 21 September 2011).

⁵Created by author with DLA representative Ralph Laurie, Table 3: Populated Basic Attribute Comparisons on MREs, HDRs, and SRBars.

⁶Ibid.

⁷Ibid.

⁸Ibid.

⁹Ibid.

¹⁰Ibid.

¹¹Ibid.

¹²Created by author. Figure 3: Feeding Quantities By Palletized Rations.

¹³Created by author. Table 7: Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0.

¹⁴Ralph Laurie, DLA LNO.

¹⁵Created by author. Table 4: FEMA Response to Hurricane Katrina Comparing MREs, HDRs, and SRBars.

¹⁶Ibid.

¹⁷Ibid.

¹⁸Ibid.

¹⁹Ibid.

²⁰Created by author. Figure 4: Projected Costs of Alternative Rations.

²¹Ibid.

²²Ibid.

²³Ibid.

²⁴Created by author. Table 4: FEMA Response to Hurricane Katrina Comparing MREs, HDRs, and SRBars.

²⁵Ibid.

²⁶Ibid.

²⁷Ibid.

²⁸Ibid.

²⁹Ibid.

³⁰Ibid.

³¹Ibid.

³²US Agency for International Development (USAID). USAID Fact Sheet #1, 13 January 2010, http://www.usaid.gov/locations/latin_america_caribbean/country/haiti/eq/documents/01.13.10-USAID-DCHAHaitiEarthquakeFactSheet01.pdf. (accessed 20 September 2011).

³³Created by author. Table 5: USAID Response to Haiti Comparing MREs, HDRs, and SRBars.

³⁴Ibid.

³⁵Ibid.

³⁶Ibid.

³⁷Ibid.

³⁸Ibid.

³⁹Ibid.

⁴⁰Ibid.

⁴¹Ibid.

⁴²Ibid.

⁴³Ibid.

⁴⁴Ibid.

⁴⁵Ibid.

⁴⁶Ibid.

⁴⁷U.S. Department of the Army, Training Circular 4-13.17 (FM 55-17), *Cargo Specialist's Handbook* (Washington, DC: Government Printing Office, 12 May 2011), 16-2.

⁴⁸U.S. Department of the Army, Field Manual FM 55-9, *Unit Air Movement Planning* (Washington, DC: Government Printing Office, 5 April 1993), Appendix D.

⁴⁹Ibid.

⁵⁰U.S. Department of the Army, Training Circular 4-13.17 (FM 55-17), *Cargo Specialist's Handbook*, Chapter 16, paragraphs 16-6 through 16-13.

⁵¹Ralph Laurie, DLA LNO.

⁵²Created by author. Table 6: Potential Aircraft Reductions in Haiti earthquake response.

⁵³Ibid.

⁵⁴Ibid.

⁵⁵Ibid.

⁵⁶Ibid.

⁵⁷U.S. Department of the Air Force, Air Force Pamphlet 10-140, *Air Mobility Planning Factors*, 12 December 2011, <http://www.af.mil/shared/media/epubs/AFPAM10-1403.pdf> (accessed 31 January 2012).

⁵⁸Created by author. Table 7: Decision Matrix Depicting Best Fit Rations Against Eight Sustainment Principles of FM 4-0.

⁵⁹U.S. Department of the Army, Field Manual 4-0, *Sustainment*, 1-1 to 1-4.

⁶⁰Ibid., Table 3.

⁶¹Ibid.

⁶²U.S. Department of the Army, Field Manual 4-20.147, *Airdrop of Supplies and Equipment: Humanitarian Airdrop* (Washington, DC: Government Printing Office, 30 April 2009), V, 1-1 to 1-2.

⁶³Damien Cave, "Fighting Starvation, Haitians Share Portions," *New York Times*, 25 January 2010, <http://www.nytimes.com/2010/01/26/world/americas/26hunger.html> (accessed 23 September 2011).

⁶⁴Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, Abandon Ship.

⁶⁵Ibid., Table 3.

⁶⁶Ibid.

⁶⁷Ibid., Table 6.

⁶⁸Ibid., Table 3.

⁶⁹Ibid.

⁷⁰Ibid., Table 7; Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, HDR, <http://www.troopsupport.dla.mil/subs/rations/programs/hdr/hdrabt.asp> (accessed 21 September 2011).

⁷¹Ibid., Table 6 and Table 7.

⁷²Jacqueline Charles, Lesley Clark, David Ovalle, and Carol Rosenberg, “New airfields, port reopening speed up aid to Haiti,” *Stars and Stripes*, 21 January 2010, <http://www.stripes.com/news/new-airfields-port-reopening-speed-up-aid-to-haiti-1.98284> (accessed 20 November 2011).

⁷³Ibid., Table 7.

⁷⁴Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, MRE, <http://www.troopsupport.dla.mil/subs/rations/programs/mre/mreabt.asp> (accessed 21 September 2011).

⁷⁵Defense Logistics Agency, Troop Support Subsistence Website for Ration Programs, HDR, <http://www.troopsupport.dla.mil/subs/rations/programs/hdr/hdrabt.asp>.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter is the culmination of the previous chapters. Chapter 1 presented the background, scope and significance of this study. Chapter 2 and 3 presented real data and formed perspective into the research questions. Chapter 4 outlined how the research data was analyzed and organized established facts into a pattern that could be interpreted. Chapter 5 now has the validity to describe what the research findings mean. This chapter will start with a conclusion and offer recommendations of the research based on the analysis on whether FEMA and USAID could more efficiently provide feeding rations during Humanitarian Assistance / Disaster Relief (HA/DRs) operations by using high calorie survival bars in lieu of MREs and HDRs while saving time, money, and resources for improved future operations.

Conclusion

There is opportunity to reduce costs while feeding more people when the SR Bar ration is used by FEMA and USAID for post disaster feeding. Logistically, a caloric-dense energy bar like the SRBar is superior to other rations like MREs and HDRs because of lower costs, increased storage capacity leading to more dispersed storage locations, reductions in transportation requirements, and simplicity. However, there are few alternative survival ration bars currently approved for USCG use for the Department of Homeland Security, and generically referred to as the SRBar presented in this thesis.¹ If the concept were expanded to include all Departments of Defense and Homeland

Security disaster response operations, then cost savings could immediately be realized among multiple vendors to bid on contracts. However, if a small ration bar were more widely accepted, other problems may arise. There are limits as to how long it can sustain populations affected by disaster operations. The SRBar meets the most urgent basic needs the quickly if available, yet does not have the endurance associated with the HDR and to a lesser extent the MRE. When natural disasters occur, the transportation infrastructure is usually affected as well meaning that outside assistance from surrounding local, state, and federal organizations may be unable to quickly respond due to access. A smaller high calorie ration can meet that capability gap at the local level until outside or federal assistance is able to assist through time and space.

Recommendations

1. Accept the SRBar concept and immediately augment ration centers with a high calorie bar to be incorporated into disaster operations standing operating procedures. The SRBar meets nutritional recommended daily intake requirements more cheaply and can more easily be moved to locations where needed. The SRBar can be prepositioned in more locations throughout counties to be managed by local civil authorities who can handle its employment at their level until federal agencies can arrive with more identifiable and more robust food rations like MREs, HDR, and fresh fruit and vegetables. Because the smaller size of the SRBar allows for more efficient storage and stockage requirements, the SR Bar better meets the National Response Framework tenet of tiered response where incidents are handled at the lowest possible level. The SRBars can easily be stored in municipal buildings allowing for rapid efficient distribution to an affected population at cost savings.

2. Recommend restrict the usage of the SRBar to replace no more than one meal per day during protracted disaster response operations. The SRBar should be incorporated into the ration cycle between other more robust options. Although the SRBar is cheaper and easier to manage, the ration is minimalistic. However, this perceived mediocrity can be mitigated by pairing it with a HDR or MRE with savings of sustainment over twenty four hours. Cost benefits can still be achieved over longer operational durations with a population not as weary of bland meal options all day long.

Suggestions for Future Research

Further study needs to identify any psychological issues associated with any survival ration bar. The survival ration bar is a paltry item and somewhat bland. Although the SRBar is a faster and cheaper solution potentially saving lives in the short term that ordinarily may be lost to starvation, it may have consequences that attribute a lack of caring by those distributing it. Obviously if someone is hungry, they will most likely not complain when an option that will ward off hunger is handed out. However after hunger is satisfied, it is hypothesized that questions regarding better foods will arise. Where are the HDRs or MREs? Is this all there is? Why is there not more? These are some questions disaster responders must be prepared to address.

Recommend Defense Logistics Agency (DLA) conduct cost benefit analysis testing at multiple military installations through the Troop Issue Subsistence Activities (TISA) located on most posts. From several years of my own experience, Soldiers will often take an MRE, or HDR if offered, and throw away components to suit their needs for the day usually keeping the “snack foods” like cakes, crackers, or candy. This waste could be mitigated if Soldiers were given the option of taking a survivalist ration instead.

Not only would they receive a ration bar that met their dietary needs and a lighter weight to carry on a training event, there could be potential savings to the DOD financially. The DOD also regularly rotates stocks and could quickly move bars to those in need prior to their shelf-life expiration. Since DOD often provides logistical support during disaster response operations, this could be an easily funded and conducted study to determine proof of principle.

¹QuakeKare USCG Certification, http://www.quakekare.com/emergency-supplies-kits/USCG_ER_Bar_2400_Cert.pdf (accessed 20 November 2011); Datrex USCG Certification, http://www.datrex.com/products.html?page=shop.getfile&file_id=227&product_id=1 (accessed 20 November 2011).

APPENDIX A

ILLUSTRATIONS OF RATION TYPES

Images shown are the operational rations discussed in this thesis. All copyright information has been recorded in the bibliography and is on file.



Illustration 1: DSCP, DLA Food Packet, Survival, Abandon Ship



Illustration 2: DSCP, DLA Humanitarian Daily Ration



Illustration 3: DSCP, DLA Meal, Ready-To-Eat (MRE)



Illustration 4: High Energy Biscuits issued by the World Food Programme

APPENDIX B

U.S.C.G. CERTIFICATE OF APPROVAL

The U.S. Coast Guard currently approves the use of the ER Bar and Datrex rations. Depicted on this page and next are the certificates issued for its use.

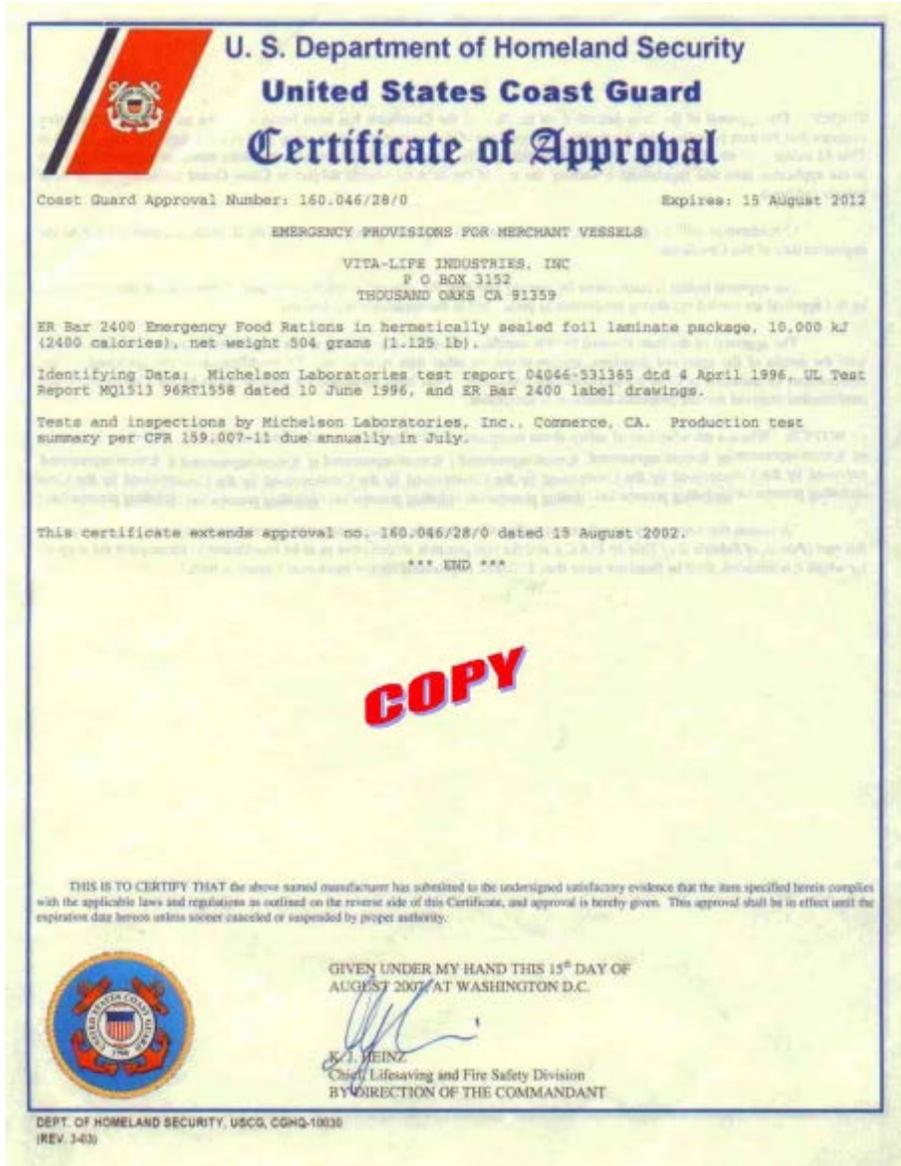


Illustration 1: USCG Certificate of Approval for the ERBar.



**U. S. Department of Homeland Security
United States Coast Guard
Certificate of Approval**

Coast Guard Approval Number: 160.046/21/1 Expires: 24 September 2015

EMERGENCY PROVISIONS FOR MERCHANT VESSELS

DATREX, INC.
P.O. BOX 1517
KINDER LA 70648

DK1400F Emergency Ration in hermetically sealed foil laminate package, 10000 kJ (2400 calories), net weight 504 grams (17.7 ounces).

Approved for use as emergency rations for survival craft subject to SOLAS.

Identifying Data: Central Analytical Laboratories test reports dated 26 April 1990, 9 September 1990, and 2 March 2001. Datrex label drawing dated 5 September 2001.

Tests and inspections by Central Analytical Laboratories, Inc., Belle Chasse, LA. Production test summary per 46 CFR 159.007-11 due annually in August.

Extends previous certificate dated September 24, 2005.

*** END ***

THIS IS TO CERTIFY THAT the above named manufacturer has submitted to the undersigned satisfactory evidence that the item specified herein complies with the applicable laws and regulations as outlined on the reverse side of this Certificate, and approval is hereby given. This approval shall be in effect until the expiration date herein unless sooner canceled or suspended by proper authority.



GIVEN UNDER MY HAND THIS 24th DAY OF
SEPTEMBER 2010, AT WASHINGTON D.C.

R. Eberly
R. EBERLY
Acting Chief, Lifesaving and Fire Safety Division
BY DIRECTION OF THE COMMANDANT

DEPT. OF HOMELAND SECURITY, USCG, CGHQ-10030
(REV. 3-03)

Illustration 2: USCG Certificate of Approval for the Datrex ration.

BIBLIOGRAPHY

Journals and Miscellaneous Sources

- Associated Press. "Clash of desperation, lawlessness in storm's wake raises ethical questions." 1 September 2005. http://www.msnbc.msn.com/id/9160453/ns/us_news-katrina_the_long_road_back/t/city-without-rules-looting-ok/ (accessed 23 September 2011).
- Clark, Charles S. "FEMA chief says pre-staging is key to rapid disaster response." *Government Executive*. <http://www.govexec.com/defense/2011/10/fema-chief-says-pre-staging-is-key-to-rapid-disaster-response/35241/> (accessed 27 October 2011).
- CNN. "Bush signs \$10.5 billion disaster aid bill," 3 September 2005. http://articles.cnn.com/2005-09-02/politics/katrina.congress_1_disaster-relief-pelosi-senate-building?_s=PM:POLITICS (accessed 20 September 2011).
- Frontline Documentary Series. "The Storm." *PBS*. <http://www.pbs.org/wgbh/pages/frontline/storm/view/#morelink> (accessed 11 November 2011).
- Knabb, Richard D., Jamie R. Rhome, and Daniel P. Brown. "Tropical Cyclone Report." National Hurricane Center, 10 August 2006. http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf (accessed 20 September 2011).
- Laurie, Ralph, Defense Logistics Agency Liaison Officer to USNORTHCOM. email correspondence, 6 September 2011.
- Maestri, Walter, Dr. Emergency Manager and Homeland Security Coordinator for Jefferson Parish. Interview on 13 September 2005, Frontline Documentary Series, "The Storm" *PBS*. <http://www.pbs.org/wgbh/pages/frontline/storm/interviews/maestri.html> (accessed 12 November 2011).
- Naylor, Brian. "New Storms, Prior Disasters Burden FEMA's Budget." *National Public Radio*. <http://www.npr.org/2011/06/06/136991203/new-storms-prior-disasters-burden-fema-s-budget> (accessed 23 September 2011).
- Rendon, John. CGSC ILE 12-01, Guest Speaker Series. 20 September 2011.
- Shaughnessy, Larry. "U.S. Air Force drops 55,000 pounds of food, water into Haiti." *CNN*, 18 January 2010. http://articles.cnn.com/2010-01-18/world/haiti.airdrop_1_airdrop-haiti-water?_s=PM:WORLD (accessed 20 November 2011).
- Sosa, Ninette, Bob Franken, Rich Phillips, and Susan Candiotti. "Terri Schiavo has died." *CNN*, 31 March 2005. <http://www.cnn.com/2005/LAW/03/31/schiavo/index.html> (accessed 23 September 2011).

World Food Program. *High Energy Biscuits–Food For Emergencies*. 14 January 2010. <http://www.wfp.org/stories/high-energy-biscuits-food-emergencies> (accessed 1 December 2011).

World Food Program. *High Energy Biscuits*. 11 December 2008. <http://www.wfp.org/content/high-energy-biscuits> (accessed 1 December 2011).

Books and Periodicals

Cave, Damien. “Fighting Starvation, Haitians Share Portions.” *New York Times*, 25 January 2010. <http://www.nytimes.com/2010/01/26/world/americas/26hunger.html> (accessed 23 September 2011).

Charles, Jacqueline, Lesley Clark, David Ovalle, and Carol Rosenberg. “New airfields, port reopening speed up aid to Haiti.” *Stars and Stripes*, 21 January 2010. <http://www.stripes.com/news/new-airfields-port-reopening-speed-up-aid-to-haiti-1.98284> (accessed 20 November 2011).

Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: Sage Publications, 2009.

DLA Troop Support Directorate of Subsistence, Operational Rations Division. *Customer Ordering Handbook and Update*, July 2011. http://www.dscp.dla.mil/subs/rations/rations_book.pdf (accessed 6 December 2011).

Keen, P.K. LTG, LTC Matthew G. Elledge, LTC Charles W. Nolan, and LTC Jennifer L. Kimmey. “Foreign Disaster Response: Joint Task Force-Haiti Observations.” *Military Review* (November-December 2010): 88. http://usacac.army.mil/CAC2/MilitaryReview/Archives/English/MilitaryReview_20101231_art015.pdf (accessed 20 January 2012).

Lubold, Gordon. “Haiti earthquake: despite fears of rioting, US starts airdrops.” *Christian Science Monitor*, 19 January 2010. <http://www.csmonitor.com/USA/Military/2010/0119/Haiti-earthquake-despite-fears-of-rioting-US-starts-airdrops> (accessed 20 November 2011).

Maslow, Abraham, H. “A Theory of Human Motivation.” *Psychological Review* 50 (1943): 370-396.

U.S. Department of Health and Human Services. *A Healthier You*. <http://www.health.gov/dietaryguidelines/dga2005/healthieryou/contents> (accessed 20 November 2011).

Government Documents

Centers for Disease Control and Prevention. "Coordinating Office for Terrorism Preparedness and Emergency Response." Hurricane Katrina After Action Review <http://www.bt.cdc.gov/disasters/hurricanes/katrina/pdf/katrina-aar.pdf> (accessed 25 September 2011).

Combined Arms Support Command (CASCOM). R-CAAT Series. Summary of Observations, Insights, and Lessons (OIL), 8 June 2010. https://webmail2.us.army.mil/iwc_static/layout/main.html?lang=en&16.01_221723 and <https://www.us.army.mil/suite/page/638703> (accessed 25 September 2011).

Defense Logistics Agency. Troop Support Subsistence Website for Ration Pricing. <http://www.troopsupport.dla.mil/subs/rations/prices.pdf> (accessed 21 September 2011).

———. Troop Support Subsistence Website for Ration Programs. <http://www.troopsupport.dla.mil/subs/rations/programs/index.asp> (accessed 21 September 2011).

———. Troop Support Subsistence Website for Ration Programs, Ration, Abandon Ship. <http://www.troopsupport.dla.mil/subs/rations/programs/survival/shipabt.asp> (accessed 21 September 2011).

———. Troop Support Subsistence Website for Ration Programs, HDR. <http://www.troopsupport.dla.mil/subs/rations/programs/hdr/hdrabt.asp> (accessed 21 September 2011).

———. Troop Support Subsistence Website for Ration Programs, MRE. <http://www.troopsupport.dla.mil/subs/rations/programs/mre/mreabt.asp> (accessed 21 September 2011).

Federal Emergency Management Agency (FEMA). "About FEMA." <http://www.fema.gov/about/index.shtm#4> (accessed 23 September 2011).

Hurricane Katrina After Action Report and Recommendations. "Emergency Support Function 8 Health and Medical." State of Mississippi. 1 June 2006. http://msdh.ms.gov/msdhsite/_static/resources/1676.pdf (accessed 25 September 2011).

Miller, Helen, Dr., Joel McNamara, and Dr. Jon Jui. Hurricane Katrina After Action Report. "Disaster Medical Assistance Team-2 New Orleans Airport: 31 August to 10 September 2005." 25 September 2005. <http://www.disastersrus.org/katrina/20051209101252-51802.pdf> (accessed 25 September 2011).

U.S. Agency for International Development (USAID). "About USAID." http://www.usaid.gov/about_usaid/ (accessed 23 September 2011).

- . “Two year commemoration of the January 12, 2010, earthquake.” <http://haiti.usaid.gov/issues/earthquake.php> (accessed 24 April 2012).
- . USAID Fact Sheet #1. 13 January 2010. http://www.usaid.gov/locations/latin_america_caribbean/country/haiti/eq/documents/01.13.10-USAID-DCHAHaitiEarthquakeFactSheet01.pdf (accessed 20 September 2011).
- . “Haiti Earthquake. Fact Sheet #6, Fiscal Year (FY) 2010,” 18 January 2010. http://www.usaid.gov/our_work/humanitarian_assistance/disaster_assistance/countries/haiti/template/fs_sr/fy2010/haiti_eq_fs06_01-18-2010.pdf (accessed on 26 September 2011).
- U.S. Department of the Air Force. Air Force Pamphlet 10-140, *Air Mobility Planning Factors*. Government Printing Office. 12 December 2011. <http://www.af.mil/shared/media/epubs/AFPAM10-1403.pdf> (accessed 31 January 2012).
- U.S. Department of the Army. Field Manual 4-0, *Sustainment*. Washington, DC: Government Printing Office, 30 April 2009.
- . Field Manual FM 55-9, *Unit Air Movement Planning*. Washington, DC: Government Printing Office, 5 April 1993.
- . Field Manual 4-20.147, *Airdrop of Supplies and Equipment: Humanitarian Airdrop*. Washington, DC: Government Printing Office, 30 April 2009.
- . Field Manual 10-23, *Basic Doctrine for Army Field Feeding and Class I Operations Management*. Washington, DC: Government Printing Office, 18 April 1996.
- . Training Circular 4-13.17 (FM 55-17), *Cargo Specialist's Handbook*. Washington, DC: Government Printing Office, 12 May 2011.
- U.S. Department of Defense. Joint Publication 3-07.6, *Joint Tactics, Techniques, and Procedures for Foreign Humanitarian Assistance*. Washington, DC: Government Printing Office, 15 August 2001.
- . Joint Publication 4-0. *Joint Logistics*. Washington, DC: Government Printing Office, 18 July 2008.
- U.S. Department of Homeland Security. “The Federal Response to Hurricane Katrina Lessons Learned,” February 2006. <http://emergency.cdc.gov/disasters/hurricanes/katrina/pdf/katrina-aar.pdf> (accessed 20 November 2011).
- . *National Response Framework*, 10 January 2008. <http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf> (accessed 3 January 2012).

———. “Target Capabilities List: A Companion to the National Preparedness Guidelines,” September 2007. http://www.fema.gov/pdf/government_training/tcl.pdf (accessed 4 December 2011).

U.S. Government Accounting Office. “Preparing for and Responding to Disasters,” 9 March 2007. <http://www.gao.gov/products/GAO-07-395T> (accessed 20 November 2011).

DISTRIBUTION LIST

Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314

Defense Technical Information Center/OCA
825 John J. Kingman Rd., Suite 944
Fort Belvoir, VA 22060-6218

Dr. Eric M. Morrison,
DLRO
USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301

Mr Alan S. Boyce
DLRO
USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301

Major Donald R. Ferguson
DLRO
USACGSC
100 Stimson Ave.
Fort Leavenworth, KS 66027-2301