THE FACTORS OF SOLDIER'S LOAD

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

by

STEPHEN J. TOWNSEND, MAJOR, USA
B.S., North Georgia College, Dahlonega, Georgia, 1982

Fort Leavenworth, Kansas
1994

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The Factors of Soldier's Load

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This study examines the factors that cause or contribute to the overloading of dismounted combat soldiers in the Army of the 1990's. This examination considers the body of literature on the subject, primarily post-World War II, to identify what factors cause soldiers to carry too much weight into battle. The goals of the study are to identify the causative factors and increase leader understanding of the problem and review previous recommendations towards solving it. From the research, the study identifies twelve factors that cause or contribute to soldier's overload: lack of appreciation of the problem, fear and fatigue, the fear of risk, the fire load, the drag of orthodoxy, failures of discipline and the enforcement of standards, myths of peacetime training, the nature of the soldier, lack of transport, the effects of technology, terrain and weather, and physical conditioning.

Load, Soldier's Load, Rucksack, Physical Conditioning, Combat Load, Fighting Load, Sustainment Load, Approach March Load, Fear, Fatigue, Risk, Training, Transport, Technology

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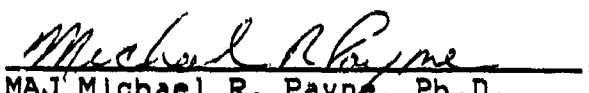

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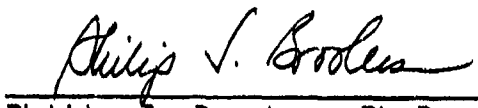

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other government agency. (References to this study should include the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

ABSTRACT

THE FACTORS OF SOLDIER'S LOAD by Major Stephen J. Townsend, USA, 111 pages.

This study examines the factors that cause or contribute to the overloading of dismounted combat soldiers in the Army of the 1990's. This examination considers the body of literature on the subject, primarily post-World War Two, to identify what factors cause soldier's to carry too much weight into battle.

The goals of the study are to identify the causative factors and increase leader understanding of the problem.

From the research, the study identifies twelve factors that cause or contribute to soldier's overload: Lack of appreciation of the problem, fear and fatigue, the fear of risk, the fire load, the drag of orthodoxy, failures of discipline and the enforcement of standards, myths of peacetime training, the nature of the soldier, lack of transport, the effects of technology, terrain and weather, and physical conditioning.

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Combined Arms Command
Center for Army Lessons Learned
Combined Arms Research Library
Joint Readiness Training Center
National Training Center
United States Army Infantry School
Dismounted Battlespace Battle Lab
Directorate of Combat Developments
Donovan Technical Library
U.S. Army Natick Research, Development, and Engineering Center
25th Infantry Division (Light)
Ranger Training Brigade

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CHAPTER ONE

INTRODUCTION

> We all knew we were carrying too much weight. It was pinning us down when the situation called for us to bound forward. The equipment had some of us whipped before we started.[1]
>
> PFC Hugo DeSantis
> Co. E, 16th Infantry
> Omaha Beach, 1944

> We attacked to secure the airhead. We were like slow moving turtles. My ruck weighed 120 pounds.[2]
>
> American Airborne Soldier
> Grenada, 1983

One of the tenets of Army doctrine in Field Manual 100-5 Operations is agility. This quality, as much mental as physical, gives us the ability to react more quickly than the enemy and to seize the initiative. For dismounted soldiers, agility is defined as a combination of strength, speed, reaction time, and endurance.[3] Agility enables our soldiers to decide, move, and fight faster than the enemy.[4] However, the comments of the two soldiers quoted above seem to indicate that we have not made much progress with regards to tactical agility in the forty years between Omaha Beach and Grenada.

This study examines a crucial component of agility, the soldier's load. Specifically this is a study of the dynamics of a soldier's load--What factors cause or contribute to the burden of our infantrymen? Why do our infantrymen carry too much weight? Is it the fault of uneducated, inexperienced, or uncaring leaders? Is it because "we have to follow Standard Operating Procedure (SOP)" or "everyone must be uniform?" What are the impacts of doctrine and advanced technology?

Today the U.S. Army's published soldier's load doctrine is found as an annex or appendix to several manuals on other subjects. Chief among these are Field Manual (FM) 21-18, Footmarches[5] and FM 7-10, the Infantry Rifle Company.[6] Mention of soldier's load guidance and planning is also made in numerous other field manuals and publications. If the Army's doctrine or guidance on soldier's load is so readily available, then why is it that we still routinely see, ten years and two wars after Grenada, soldiers carrying excessive loads during training exercises and operations? Do military leaders, specifically leaders of light infantry, understand the historical causes of soldier overloading? Are there any new factors contributing to this problem?

Historical Background

Historically, armies have always been interested in the loads their soldiers carried into battle. It has been generally accepted through the ages that the heavier the load on the soldier's back, the less effective he is. German historians note that the Legions of Rome took pains to lighten the burden of their infantry. Great captains of history, such as Frederick the Great, Napoleon, and Scharnhorst, all found it necessary to give personal guidance as to the packing lists of their troops.[7] Others, such as Phillip of Macedonia and Stonewall Jackson, were known for their use of light-traveling infantry.[8]

One of the early studies of the soldier's load was conducted in the late 1800s by the German Frederick Wilhelm Institute. The tests measured the ability of soldiers to carry various loads in differing temperature ranges.[9] Another study was undertaken by the British Royal Hygiene Advisory Committee which surveyed soldier's burdens through history and published its findings in 1922.[10] The American Soldier-Author Brigadier General S. L. A. Marshall studied the problem for the U.S. Army as he conducted after-action reviews and interviews with soldiers and Marines during World War Two.[11]

The American Army's study of the Soldier's Load has continued into more modern times. Between 1954 and 1990 the

US Army commissioned and conducted no fewer than five major studies of the soldier's load.[12]

The U.S. Army Combat Developments Command (USACDC) conducted "A Study to Conserve the Energy of the Combat Infantryman" in 1964.[13] The study evaluated several factors relating to infantry energy expenditure and a primary factor was found to be the soldier's load. The conclusions of this study were considered to be so important that the Commanding General recommended:

> ...appropriate Army service schools prepare and present a continuing program designed to indoctrinate commanders and NCO's in the effects of overloading the combat infantryman.[14]

This recommendation was approved by the Secretary of the Army later that same year.

"The Carrying of Loads within an Infantry Company," published by the U.S. Army's Natick Laboratories in 1973, focused on more efficient ways to help the infantryman carry his burden. Natick reviewed the issue of soldier's load in detail and made specific recommendations on the capacity of issued load-carrying equipment (LCE); the determination of appropriate loads (using individual physiological make-up as a guideline); and how to best distribute and carry the load.[15]

In 1988 Natick Labs published "Technology Demonstration for Lightening the Soldier's Load." This

study examined the possible applications and pitfalls of advanced technology programs in reducing the soldier's burden.[16]

Focus

The purpose of this study is to identify the factors causing soldier overload today. The goal is to increase leader understanding of the problem and offer some practical recommendations, deduced from the research, towards solving it.

With the modernization and considerable mechanization of our Army, few soldiers actually carry any significant weight on their backs into training or battle. The soldiers still doing so often are the Lightfighters of the Light Divisions, the Paratroops of the 82d Airborne, The Air Assault troops of the 101st Airborne, the Rangers, and Special Forces. However, based on mission requirements, any of our soldiers could find himself in a dismounted combat situation.

The phenomena of the "human pack mule" is limited almost exclusively to battalion level and below. Those at higher levels, in most cases, operate primarily from fixed sites or move about the battlefield by vehicle. Normally accompanying our infantryman you will find the small but sturdy groups of hardened combat support soldiers that assist our light infantry--the forward observers, the sappers, Stinger teams, and the combat medics who are

equally, if not more heavily, burdened.[17] All of these soldiers comprise the group defined as Dismounted Combat Soldiers by the U.S. Army Infantry School.[18]

Questions

The primary question of this study is: What are the factors that cause soldiers to be overburdened on today's battlefield? In answering this question this study will answer several others as well.

First, what causative factors have emerged from history and previous study? This study examines these known factors to determine which among them are still valid and relevant to today's army. A second question to be answered is what new factors have emerged in more recent times?

Assumptions

Before engaging in this study a few assumptions are essential to assist in establishing the boundaries of the analysis. First, the results of previous documented studies on the negative impact of excessive soldier's loads are valid. This discussion does not attempt to derive new data on these effects.

Secondly, the load planning guidance espoused in these studies, and as official U.S. Army doctrine, is accurate and valid. This study will not attempt to discredit or suggest alternatives to this data.

Definitions

Essential to the common understanding of the problem, the following terms and definitions serve as a common departure point for all further discussion of this topic.

Approach March Load. This is the load carried by the soldier in addition to his fighting load. It consists of the remainder of his variable items. In almost all cases, it is carried in an assault pack or rucksack and is normally dropped before or upon contact with the enemy.

Combat Load. The fighting load plus the approach march load. This is the load the soldier normally has with him during combat operations and with it he can sustain himself for protracted periods between resupplies.

Common Items. Those items carried or worn by all soldiers regardless of threat, enviroment or mission (i.e., Battle Dress Uniform with boots).

Contingency Load. Those items of personal and unit equipment not required for the current operations. Normally consolidated and stored at a higher level. This load might include spare uniforms, cold weather gear during the warm months, or anti-armor weapons when the enemy has no armored vehicles.[19]

Duty load. Weaponry, ammunition, and other equipment associated with a particular duty position and required to properly accomplish the duties of that position

in any situation regardless of threat or enviroment (i.e., a rifle squad leader carries an M16A2 rifle, some number of loaded magazines, a compass, and an AN/PRC-126 squad radio with pouch). Field Manual 21-18 calls the combination of Common Items and Duty Load the Minimum Load Configuration (MLC).

Factor. One that actively contributes to an accomplishment, result or process. One of two or more quantities that when multiplied together yield a given product. Defined in Webster's II New Riverside University Dictionary, 1984.

Fighting Load. The weight carried by the soldier when actually in contact with the enemy. This load consists of only those items required to fulfill the tasks of his duty position during the contact. This load includes common items, the duty load, and some variables.

Soldier's Load. The weight carried by a light infantryman or combat support soldier engaged in direct support of a reconnaissance unit, light infantry company, battalion, or in some cases, regiment/brigade. This load includes everything the soldier wears or carries on his back and has several components.

Sustainment Load. This is the remainder of the unit equipment required to conduct sustained operations. It is normally consolidated at company or battalion level and transported by vehicle. These items are normally delivered

to or carried by the unit when required for a specific mission (i.e., grappling hooks needed to assault an urban area or create a breach). It may also include unit sets (squad bags) of pioneer tools or protective equipment (chemical protective overgarments).

Variables. All other items that the soldier carries (addtions to the MLC). These items vary dependent on the mission, enemy threat, and environment. Examples are: Night Vision Device (mission), Protective Mask (threat), and Goretex Parka (enviroment). By its definition, this is normally the only component of the soldier's load that can be influenced by the chain of command.[20]

Potential Problems

There is almost universal agreement that excessively loaded soldiers have a negative impact on unit mobility and efficiency. For the most part, the cause and effect relationship here is well understood. The disagreements occur when we try to determine why our soldiers are still overloaded after years of correct problem identification.

Some will not agree that our soldiers are overloaded. Still others state that nothing further can be done to lighten his load. Other difficulties arise when examining the various components of the combat load, especially the duty load and variables.

Over the years different units have established various Standard (or Standing depending on your training) Operating Procedures (SOPs) to simplify and standardize routine unit functions. These exist in most units for set-up and wear of equipment, issuance of ammunition basic load, and prescribed packing or load lists for rucksacks and duffel bags.

These SOPs have both positive and negative effects on the soldier's load. They streamline troop leading procedures, speed routine and recurring actions, and insure everyone has a common start point for reference. However, when the results are soldier's carrying equipment they will not use so all "look uniform" or when leaders direct a packing list because the "SOP says so," then they impact the soldier's load in a negative way. I will examine this problem in more detail.

As mentioned previously, one significant problem all studies of soldier's load face is that there is little agreement about what can be deleted from the soldier's load to make it lighter. Summing this up perfectly is this quote from the British commission reporting in "The Load Carried by the Soldier":

> Everyone agrees that equipment must be lightened. But when it comes to saying what equipment can be dispensed with, there is endless variety of opinion. Aye, there's the rub.[21]

Most infantrymen have strong opinions on this subject based on their training and experiences. Getting more than two to agree to any specific recommendation is a daunting task. For this reason, the primary goal of this study is to re-examine the dynamics of soldier's load and to increase leader understanding of the subject. The actual task of making specific adjustments to SOPs, unit basic loads, and packing lists is better left to officers and NCOs leading our units in the field. Field Manual 7-10 states, "There is no standard solution to the problem of overloading soldiers." It remains a commander's responsibility to apply the doctrinal guidelines to lighten his soldier's load.[22]

Endnotes

[1]S. L. A. Marshall, The Soldier's Load and the Mobility of a Nation. (Quantico, Virginia: Reprinted by The Marine Corps Association, 1980), p. 43.

[2]Major J. M. Dublk and Major T. D. Fullerton, "Soldier Overloading in Grenada," Military Review (January 1987): p. 39.

[3]Field Manual 100-5, Operations, (Department of the Army: June 1993) pp. 2-6, 2-7.

[4]Army Development and Employment Agency briefing packet "Lightening the Soldier's Load: A Systems Approach: 1986 and 1987 versions.

[5]Field Manual 21-18, Footmarches, (Department of the Army: June 1990) pp. 5-1 through 5-23.

[6]Field Manual 7-10, The Infantry Rifle Company, (Department of the Army: December 1990) pp. 8-8 through 8-11.

[7]Marshall, p. 9.

[8]Ibid., p. 25.

[9]Ibid., p. 48.

[10]Ibid., p. 23.

[11]Ibid.

[12]Major N. W. Lothian, RAMC, "The Load Carried by the Soldier." Reprinted by U.S. Quartermaster General, Research and Development Branch, (n.p., 1954). U.S. Army Infantry Combat Developments Agency, "A Study to Reduce the Load of the Infantry Combat Soldier." (Fort Benning, Ga.: 1962). U.S. Army Combat Developments Command, "A Study to Conserve the Energy of the Combat Infantryman." (Fort Belvoir, Va.: February 1964). U.S. Army Natick Laboratories, "The Carrying of Loads within an Infantry Company," (Natick, Mass: May 1973). U.S. Army Natick Research, Development, and Engineering Center, "Technology Demonstration for Lightening the Soldier's Load," (Natick, Mass: February 1988).

[13]USACDC, "A Study to Conserve.

[14]Ibid., p. 15.

[15]USANL, "The Carrying of Loads...," p. 1.

[16]USANRDEC, "Technology Demonstration...," p. 6.

[17]FM 7-10, , pp. 8-9, 8-10.

[18]U.S. Army Infantry School, "Soldier Modernization Plan: Executive Level Review." (Fort Benning, Ga: December 1991).

[19]FM 7-10, pp. 8-9, 8-10.

[20]Ibid.

[21]Lothian, p. 64.

[22]FM 7-10, p. 8-2.

CHAPTER TWO

REVIEW OF LITERATURE

> ...what we want is not a light battalion but a light army...such mobility is only to be obtained when the army is formed of sturdy men, well practiced in peace, well fed in the field, and carrying as regards all arms a really practical equipment. An army which marches light will also maneuver freely.[1]
>
> Helmuth von Moltke

This chapter forms the basis for the thesis and introduces the reader to the literature examined. The review was mainly limited to those works that impact on the topic of the modern U.S. soldier's load since World War Two. In the case of the exceptions to this limitation, sources were used that, in the opinion of the author, were applicable to the purpose and had significant information to offer.

From the current literature in the subject an initial list of factors can be identified. This list, found at Figure 2, is examined in depth in Chapter Four.

Current U.S. Army Load Doctrine

> The primary consideration is not how much a soldier can carry, but how much he can carry without impaired combat effectiveness-- mentally or physically.[2]

Anchoring the research of the problem of soldier's load is the current U.S. Army doctrine designed to train and guide the Army's leaders. This doctrine is contained in three basic documents, all of them updated since 1990; FM 7-8, Infantry Rifle Platoon and Squad, FM 7-10, The Infantry Rifle Company, and FM 21-18, Foot Marches.

The three manuals are up-to-date and well-synchronized, providing complementary subject information pertinent to their larger purpose. All three address the factors of soldier's load, load management techniques, and load training. A basic understanding of this doctrine is necessary to provide a foundation in the search for the causes of soldier overload.

First, a soldier can carry approximately 30% of his body weight and still retain a significant percentage of his fighting ability (strength, agility, alertness, stamina). This equates to approximately 48 pounds based on older data showing the average U.S. soldier weighed 160 pounds. The 1988 Anthropometric survey of U.S. Army personnel showed that the average U.S. soldier weighed 171.27 pounds[3] and recent data from JRTC shows that the average infantryman training there weighs about 173 pounds.[4] These figures suggest that 30% for the average infantryman means somewhere between 48-52 pounds. For each ten pounds carried over 30%, the soldier loses a proportional amount (approximately 15%) of his agility

(a combination of strength, speed, reaction time and endurance).[5]

Secondly, if a load exceeds 45 percent of a soldier's body weight (approximately 72-78 pounds), then he loses fighting ability significantly and is at greater risk for injury. Thirdly, vigorous load training can only improve a soldier's ability to carry weight by between ten and twenty percent of the maximum he could carry before any load training. Beyond this increase, there is no improvement in load carrying capacity, only in risk of injury.[6]

Finally, a soldier can be required to carry emergency loads of 100 to 150 pounds for short distances, up to 20 kilometers in a day, for several days. However, commanders must take precautions to keep the troops away from possible contact with the enemy; to rest the troops before committing them to an action; and to be aware that they are significantly more susceptible to injury with these loads.[7]

Field Manual 21-18 outlines other points of our soldier's load doctrine. First, the stress of combat weakens soldiers and can cause exhaustion. Soldiers should be conditioned with heavy loads in training but sent into battle as lightly loaded as possible.

Secondly, commanders must not expect their men to carry equipment to cover every contingency or possible

combat situation. Commanders must accept risk in order to lighten the load.

Third, commanders are responsible for obtaining transport for the portions of the load that the soldiers are not carrying if it will be needed later.

And finally, so that the soldier is confident that his needs will be met, the commander must ensure that the logistics system provides what is needed, when and where it's needed.[8]

Commander's Estimate

The dynamic with the first impact on the soldier's load is the commander's estimate. This estimate, using the acronym METT-T (mission, enemy threat, terrain and weather, troops, and time available) is the first filter through which the soldier's load passes as a commander assesses how best to conduct a given task.[9]

Mission

What task is the soldier and unit expected to perform at the objective? What munitions or special equipments are needed for the task? How much movement will be involved in the mission? Are means of transportation available?

A force required to conduct an air assault and subsequent attack against a fortified position in an urban area will likely require large amounts of ammunition,

particularly hand grenades. The available helicopters will enable the commander to conserve the energy of his troops during movement and to resupply them as they fight.

In contrast, a unit tasked to conduct a search and attack to find a guerilla enemy in a thicketed swamp will probably require much less ammunition but will be forced to conduct much of its movement on foot.

Enemy Threat

What enemy capabilities will the unit face enroute to and at the objective? Is there an armor threat requiring anti-armor weapons? An air threat requiring man-portable air defense weapons? Does the threat of enemy nuclear, biological, or chemical (NBC) use require us to carry or wear protective gear? Should we carry radio encryption equipment if the enemy has no capability to intercept or monitor our transmissions?

Probably more than any other factor of METT-T, the estimate of the enemy's capabilities require the commander to accept risk if he is to fight light. In almost every case there will be more potential threats than the unit can protect itself against. The commander must determine which threats he is most likely to face.

In order to leave behind heavy items that are not likely to be used, the commander must be satisfied that his enemy is unlikely to employ a capability that he may

possess. If he does not take this risk, the combat power of his unit will suffer.

Terrain and Weather

What terrain must be negotiated by the unit enroute to, at, or upon leaving the objective? What elements of the weather will the unit have to endure?

A unit required to negotiate a mountainous area in freezing conditions might require special equipment such as ropes and snaplinks and sweaters or parkas for protection from the elements. These requirements will differ markedly from the unit defending a key installation in a tropical region.

These two factors, like enemy threat, require the commander to accept risk to stay light. In a desert region, the commander may choose to rely on aerial resupply rather than force his unit to carry additional canteens. By doing so, he risks going without water if the resupply does not materialize. In a cold-weather enviroment, a commander may elect to carry only one sleeping bag for every other man instead of each man carrying his own.

Troops

The commander must estimate the abilities of his own unit to meet the challenges of the mission ahead. What is their level of physical conditioning? How much has

their condition been degraded by previous operations? How much rest and food have they had recently?

Load carrying causes fatigue. Fatigue and the weight of the burden itself reduce the ability of the soldier to react to the enemy and place him at a disadvantage when clear thinking and swift action is required.[10]

Before combat, commanders can prepare the unit for the effects of fatigue and fear through tough physical conditioning with heavy loads, and instilling good unit morale, discipline, and teamwork. During combat, commanders can only reduce these negative effects through strong leadership and by fighting light.[11]

Time Available

How much time is available to prepare for the mission? An operation that must be launched immediately will reduce the unit's ability to properly tailor the soldier's load. This can result in overloaded soldiers. This problem can be mitigated by the use of good unit SOPs (although unit SOPs can be a double-edged sword as we will explore in more detail later).

How long will the operation last? If adequate resources for resupply cannot be obtained, the soldier's load will increase with the duration of the mission.[12]

The application of the commander's estimate provides the foundation upon which all mission planning and

preparation, to include the soldier's load, is based. FM 101-5, Staff Organization and Operations, indicates that other factors, in addition to METT-T, are a part of the estimate. These factors include the estimates of the staff and the commander's personal experience and knowledge.

Having reviewed the current doctrinal framework, Chapter Four will examine other factors that impact on soldier's load that are not addressed or fully explained in doctrine.

Previous Study

Since the soldier's load has been of interest to military leaders throughout history, especially in the nineteenth and twentieth centuries, there is a good body of written knowledge available. However except for specific studies of the topic by research institutes, there are few books devoted specifically to the topic; most works address the issue only as it relates to other larger topics such as infantry operations or mobility.

S. L. A. Marshall

One significant exception and a major work in this area, is Brigadier General S. L. A. Marshall's The Soldier's Load and the Mobility of a Nation. First printed in 1949 in various military journals in the United States and abroad under the title "The Mobility of One

Man," it was published for the first time in 1950 and is devoted entirely to the subject of soldier's load.[13]

This quick-reading book is based on Marshall's study of previous research and his own interviews of combat infantrymen during World War Two and the Korean Conflict. While Marshall's methods and conclusions in other research endeavors have been the subject of some disagreement, this particular work has enjoyed wide critical acclaim in military circles and is considered by many to be the definitive source on the subject.

Marshall examined the historical problem of soldier overloading and compares it to the similar problem faced by soldiers during World War Two. Using graphic examples from units engaged in both the European and Pacific theaters of war, Marshall addressed the causes of overloading and suggested ways at solving the problem. He went on to place the problem of individual soldier mobility into a larger context of the mobility of an entire nation.

General Marshall addressed a complete spectrum of causes of soldier overloading. Probably his strongest theme is the lack of appreciation, by tactical leaders, of the debilitating effects of stress and fear on the average soldier and its resulting effect on his ability to carry a load.[14]

Other factors explored by Marshall and examined in Chapter Four are: Ignorance of the problem; the failure of

leadership to establish and enforce load guidance; the consequences of burdening soldiers with excessive loads of ammunition (he referred to them as "fire loads"); a fear of risk-taking on the part of commanders and their staffs; the nature of the soldier himself; the effects of weather; improper lessons learned from training during peacetime (he called these the "myths of peacetime training"); the influences of technological innovation; and the negative impacts of the conservative and traditional nature of much military thought and procedure (he called this the "drag of orthodoxy").[15]

S.L.A. Marshall's work provides the reader and student of soldier's load with an excellent study of the subject. His is a comprehensive treatment that is almost still wholely applicable 45 years later. Marshall's conclusions provide us an excellent point of departure in our task of identifying the factors affecting the soldier's load in the '90's.

Commissioned Military Studies

The soldier's load has been the subject of regular and relatively intense study by the various militaries of the world. A sampling of some of these works was studied for the purposes of this thesis.

Major Lothian, RAMC

In his 1922 study, "The Load Carried by the Soldier," author Major N. W. Lothian of the Royal Army Medical Corps analyzed historical examples to examine numerous dynamics of soldier physical performance. These factors included load weight, load composition, physiological limitations, equipment design and management, and rate of march.[16]

Lothian reached the conclusion that throughout history the soldier's load "...peaks when equipment has become so cumbersome as to reduce mobility to vanishing point" and falls again when a "wise commander" intervenes by lightening the load, "...restoring mobility, and so ensuring success." He noted that this pattern repeats itself as the load rises again during periods of peace.

Lothian attributed this increase to the false assumptions that the soldier could support the increased weight in battle; would be better off for having the new items he was issued; and if the load was too heavy, some form of "auxiliary transport to carry this equipment on the march" would be available.[17]

Army Combat Developments Studies

In 1962 the U.S. Army Infantry Combat Developments Agency undertook a study entitled, "A Study to Reduce the Load of the Individual Combat Soldier." Its primary purpose was to determine the equipment the infantryman

needed to perform his mission in tropic and temperate zones. The study, following the Army's experience in Korea, was obviously heavily influenced by the writings of Marshall and says little to contradict his findings.

Some of the major causes of overloading included commander's and staff's lack of awareness of the problem and the associated lessons of history (the study recommended soldier's load instruction for all levels of military education up to and including the War College); excessive quality and durability requirements for new equipment; and the impact of tradition and resistance to change. Other factors noted were inadequate SOPs; poor utilization of available transportation assets; green troops who carry more than they need when they deploy; the trade-offs between killing power (mobility and firepower) versus troop protection; the often poor utilization of available transport assets; and finally the fact some weapon systems, by their construction and organization, automatically overload their crews.[18]

The U.S. Army Combat Developments Command performed a follow-up study in 1964 entitled "A Study to Conserve the Energy of the Combat Infantryman." Due to apparent inaction on the recommendations of the 1962 study, the 1964 version sought to re-energize the system with the specific purposes of: determine how the infantryman's load could be lightened; determine the period of time the

infantryman should be self-sufficient; determine which specific items of clothing and equipment were in need of improvement; and determine how the battalion supply system could be made more responsive to the soldier.[19]

The study considered the effects of durability and functional requirements on item weight. It recognized that items often had durability ratings often much longer than their expected combat lifespan. The study also recognized that the standard practice of equipping the entire army with uniforms and basic equipment designed for the infantry may be counterproductive, resulting in increased cost and weight.[20]

The 1964 study included an excellent discussion of the tradeoffs and risks between protection and weight. It recognized that technology was at a crossroads where replacement items could be developed that would have a similar or slightly improved protective factor for a great weight savings or the protective factor could be vastly improved for a similar item weight.[21]

Other outcomes of the study were: formalization of the concepts of fighting load and existence load; a recommendation to pursue the development of a light (one pound) expendable protective mask to kept with the soldier at all times, allowing his M17 mask to be kept at the unit trains and brought forward when needed; and recommendations to pursue development of a new helmet and body armor using

lightweight composite fiber technology (this recommendation eventually developed into the Kevlar helmet and jacket worn today).[22]

Natick Research, Development, and Engineering Center

In 1973 the then U.S. Army Natick Laboratories (hereafter referred to as Natick) published "The Carrying of Loads within an Infantry Company." The purposes of the study were to study the capacity of available load carrying equipment, examine the current weight of the soldier's load, the carrying of equipment by duty positions, and how the load could best be distributed and carried.[23]

The study made several interesting observations, among them were: the advent of nylon material, in lieu of cotton web, in the construction of load bearing equipment reduced the soldier's load by an average of 36% when dry--even more when wet; reductions in weight in one part of the load tend to be offset by gains in another part (especially by adding more ammunition); inexperienced soldiers initially tend to carry too much when left to decide for themselves; and finally that peacetime maneuvers cannot replicate the energy drain that fear creates in combat.[24]

The 1973 study uses anthropometric data from the 1966 survey (indicating that the average soldier weighed 156 pounds) but goes further to state that basing load planning on this figure is inadequate because up to 50% of

short, the "average soldier" concept is an over-simplification and good load planning must take soldier body size into account.[25]

In 1988 Dr. James B. Sampson of Natick published an report entitled "Technology Demonstration for Lightening the Soldier's Load." In light of the Army's recent initiatives with the Light Infantry Division concept the report re-examined the problems of soldier's load and drew some conclusions on the ability of technology to help.

Some of the reasons cited for soldier overload were, "commander's orders to pack certain items, insufficient information about the mission and weather, lack of confidence in the supply trains, and the desire to be ready for any contingency." The study concludes that technology often contributed to, rather than reduced, the load. This is attributed to a need for increasing protection, more lethal weapons, more complex communications and night vision equipment, and increasing attempts to integrate items and make them multi-functional which actually decreases their flexibility.

Another interesting technology factor is that many researchers and developers do not understand the nature and origins of the problem and, more importantly, the way it is resolved in the field. A recent example of false load savings attributable to this disconnect is the replacement of the M60 machinegun by the M249 Squad Automatic Weapon

(SAW) at platoon level. It was assumed that this would "save" 26.5 pounds from overall lighter weight of the SAW and the deletion of the M60 tripod and spare barrel. This projected savings was incorrect because the platoon-level SAW was intended to be fired, with a spare barrel, from the tripod like the M60--not bipod mounted like the squad-level SAW.

Finally, the report shows some planned weight savings that never came to pass, primarily due to funding, such as small lightweight binoculars, lightweight chemical suits, lighter rations (the meal-ready-to-eat [MRE], which was much lighter than the canned C-ration, has actually gotten heavier in the last five years), and smaller flashlights.[26]

Also published by Natick in 1988 was a new anthropometric survey that showed the median male soldier to weigh 171.27 pounds. A significant increase over the 1970's figure of approximately 165 pounds.[27]

Modern Combat

The Falklands War, 1982

The Battle for the Falklands written by London Evening Standard reporters Max Hastings and Simon Jenkins follows the war over these South Atlantic Islands between Argentina and Great Britain. This war, unlike most preconceptions of modern conflict, was fought almost

entirely by dismounted light infantrymen. They marched long distances with heavy loads and little in the way of air, fire, or logistical support.

Hastings' and Jenkins' work is mainly a treatment of the war as a whole but author Hastings accompanied the leading infantry units as they advanced across the islands and he makes many observations on their conditions and operations.

He writes that the heavy burdens of the British infantry units were due to an unfortunate combination of several factors: Extremely long lines of communication; the need to deploy rapidly while suffering from a lack of strategic lift; the vagaries of some of the worst terrain and weather on earth; problems arising from a lack of the appropriate physical conditioning in some units; and the more nebulous problem of insufficient logistical challenges built into most peacetime training exercises.[28]

British Major General (retired) Julian Thompson, former commander of 3d Commando Brigade during the Falklands campaign, considers the aspects of logistics in armed conflict in his 1991 book The Lifeblood of War. He examines the support of campaigns past, present, and future and recounts the lessons of the Falklands in a section on amphibious logistics.

Though primarily oriented at higher levels of logistics, included among what Thompson calls the "false

lessons of peacetime training" are some lessons that, nonetheless, bear on the burden of the individual soldier. Among these is the lesson that small wars and most exercises, emphasizing maneuver forces and operations, do not adequately test or prepare the logistics system. Rarely are commanders forced to choose between moving men or supplies. In war, if transport is limited, men will march carrying some of their supplies and the available transport will be busy moving the rest.[29]

The Grenada Intervention, 1983

On October 25th, 1983 American Rangers, Marines, Paratroopers, and Special Operations Forces invaded the Carribean island of Grenada in the United States' first major ground combat action since the end of the Vietnam War a decade earlier. Many of the soldier's load lessons learned by Americans in WWII and Korea and recorded by S.L.A. Marshall were revisited in the tropical heat of Grenada. A participant in the operation, Major Mark Adkin, recorded some of these lessons in his book Urgent Fury: The Battle for Grenada.

Though his work is a treatment of the events leading up to and the actual operation itself, his summary of problems plaguing U.S. forces during the initial invasion included "overburdened infantry." Some of the factors he indicated caused this problem were: uncertainty on the part of commanders, planners, and soldiers; an

overall lack of combat experience in the force; scarcity of strategic lift; a critical need for rapid deployment; limited reception capabilities at arrival airfield; a lack of supporting vehicles; rugged hilly terrain; and stifling tropical heat.[30]

In 1987 Military Review published an article by Majors J.M. Dubik and T.D. Fullerton. They examined the results of psychological studies that Walter Reed Army Medical Center conducted following the invasion of Grenada. Using the Marshall-pioneered technique of interviewing the participants of the fighting, they explored the effects of the soldier's load among other topics.

The essential conclusion Dubik and Fullerton reached was that "uncertainty" was a factor that caused solider overloading in Grenada. Uncertainty caused by a lack of operational information, rapidly changing information, lack of common training and SOP's between some units, and a lack of trust in the capabilities of other units or of the "system" to provide for needs. This uncertainty caused the initial units to pack for the worst.[31]

The Panama Intervention, 1989-90

In their 1991 book Operation Just Cause: The Storming of Panama, authors Baker, Donnelly, and Roth reconstruct the events of the United States' armed intervention in Panama in December 1989. The book is a

compilation of interviews and eyewitness accounts that take the reader from the tense period leading up to the invasion, through H-hour and the subsequent weeks of military operations, and finally the redeployment home.

Several issues of soldier's load are discussed as well. Some of these issues include: excessive ammunition loads; failures to enforce existing SOPs; mission and task analysis; uncertainty; tropical heat; and a paucity of lift assets ranging from strategic aircraft to tactical helicopters and trucks.[32]

Center for Army Lessons Learned

The U.S. Army Center for Army Lessons Learned (CALL) serves as the Army's repository of recorded observations and lessons gained on all major operations and exercises. They are responsible for gathering, analyzing, and disseminating these lessons Army-wide so that all units may learn from the experiences of others.

CALL publishes this information in bulletins throughout the year and are usually organized by battlefield operating systems (BOS) or a major topic such as "light infantry" or "sustainment".

CALL bulletins have included several soldier's load lessons in recent years. Among these lessons are: commanders often do not understand the importance of their role in establishing and enforcing soldier's load

standards; unit SOP's often do not address soldier's load concerns; although pre-combat inspections (PCI) are critical, leaders routinely fail to inspect their soldier's rucks; uncertainty over the threat, nature, and duration of missions has caused soldiers to deploy with twice as much ammunition as was needed and with unnecessary comfort items; leaders must evaluate and accept or refuse risk with regards to protective armor versus agility and heat stress; many unit physical fitness programs fail to train to load carrying; lack of support vehicles increases the load; and often we do not task the logisticians to assist our tactical commanders in getting their loads forward.[33]

Combat Training Centers

Our combat training centers (CTC's) provide our maneuver units with the most intense and realistic training experience short of actual combat. The Joint Readiness Training Center (JRTC) in particular is focused on light, dismounted soldiers. The National Training Center (NTC) and the the Combat Maneuer Training Center (CMTC) are oriented primarily on heavy forces.

The JRTC records soldier's loads throughout units each rotation. The weights and records of the items found upon inventory of the rucks are analyzed and feedback is given to the player units. These reports, also forwarded to CALL, yield some telling lessons on soldier's load.

In a recent review of 10 units rotations, six units did an excellent job of monitoring the soldier's load by tailoring loads, cross-leveling equipment, leader's inspections, and by consolidating or caching rucks while on operations in an area of operations.

Almost as common however were reports of units that "talk" soldiers load up and down the chain of command. But when the troops cross the line of departure, the average rifleman's load weighs 100.72 pounds. The chain of command often does not take personal action to review or inspect the packing list--often simply referring to the unit's SOP and making no effort to eliminate unessential items or cross-level equipment based on mission needs.

Other comments by the observer/controllers (O/C's) include that often units do not attempt to adjust, cross-level, or cache equipment once in their area of operations even after noting undue fatigue early on the march and correctly attributing it to the heavy loads. Units also do not fully understand the real impact of actual basic loads of ammunition because they rarely train with them at home station. Even at the CTC's, which do a reasonable job of simulating mines, anti-tank, mortar and other rounds, it is not unusual to see soldiers crossing the start line with only three of seven magazines filled or a machinegun team with only 3-400 rounds.

On a positive note, the O/C's report that most units improve their load management as they progress through the rotation from search-and-attack operations to the deliberate attack. However, another explanation is possible, the search-and-attack is characterized by uncertainty over enemy strength, locations, and intentions and by decentralized and dispersed small-unit operations; conditions leading to difficulty in resupply and heavy rucks. In contrast, the later deliberate attack is typically conducted with good intelligence on the enemy and significant unit preparation and rehearsal; conditions favorable for load tailoring. What would the soldier's load be like if another search-and-attack were required after the deliberate attack?[34]

U.S. Army Infantry School

The U.S. Army's Infantry School (USAIS) is the center of gravity for all matters concerning infantry and other ground troops. This responsibility includes the soldier's load and USAIS has several units, departments, and agencies that work the issue, among them: the Directorate of Combat Developments, the Ranger Training Brigade, and the new Dismounted Battlespace Battle Lab (DBBL).

USAIS maintains oversight on the soldier's load through the recently established Land Warrior Project. One

of the project's functions is to monitor all systems that are developed or modernized as part of the Army's Soldier Modernization Program (SMP). SMP is a program that treats the dismounted soldier as a fighting system and everything he wears, carries, uses, or consumes is a component of that system. A primary role of the project is to integrate all components and monitor the weight of all new items to insure weight reductions occur over time.[35]

A 1991 executive review of SMP concluded that the modern infantry soldier was overloaded and that effective loads could only be achieved through the use of transportation assets to move portions of the load. SMP seeks to save weight through the use of integrated high technology in future developments and has had some success in achieving this goal.[36]

Problems blocking more significant progress in this endeavor include funding cuts, the inclination of some decision makers to opt for increased capability over weight savings, and the acceptance of item weights that slightly exceed the limit expressed in the operational requirement. These gains are easier to accept if the item meets all other requirements or if they are compensated by weight savings on other items.[37]

Periodicals

The U.S. Army's keen interest in this subject resulted in Marshall's investigations and in numerous after-action reports and interviews from soldiers and commanders from every U.S. action since World War Two. Many of these interviews are available or have been summarized in articles in various military journals. Many of these journals contain regular articles addressing the soldiers load, most notably Infantry magazine[38], and were useful in providing information for this study.

Other useful journals included Military Review, Army Logistician,[39] and Marine Corps Gazette.[40] These articles were too numerous to address here. Suffice it to say that they reinforce and do not contradict the information from the other literature reviewed and any significant points are addressed in Chapter Four.

Applications to Current Study

The body of extant works form a useful and necessary backgound of relevant information on which to base this study. They show the validity of current conclusions on soldier's load by discussing the results of earlier, similar studies and by historical example.

Existing works form the basis of the effort to identify all of the factors contributing to soldier's load

in modern times. This current study attempts to add to this body of knowledge on the soldier's load by developing a current list of the factors that cause soldier overload in today's modern light units.

The author intends that this study serve as a useful summary of soldier's load dynamics and as a practical guide for the professional education of modern infantry leaders.

Endnotes

[1]Lothian, p. 64.

[2]FM 21-18, p. 2-7.

[3]U.S. Army Natick Research, Development, and Engineering Center, "1988 Anthropometric Survey of U.S. Army Personnel: Methods and Summary Statistics," TR 89/044. (Natick, Mass: September 1989) p. 320.

[4]Soldiers Load Information and Data provided by U.S. Army Joint Readiness Training Center, January 1994.

[5]Army Development and Employment Agency briefing packet "Lightening the Soldier's Load: A Systems Approach," 1986 and 1987 versions.

[6]FM 7-10, p. 8-8.

[7]Ibid., p. 8-9.

[8]FM 21-18, p. 2-8.

[9]FM 7-10, pp. 8-8, 8-9.

[10]Ibid., ch. 5.

[11]FM 21-18, p. 5-6, 5-8.

[12]FM 7-10, p. 4-16.

[13]Information from Donovan Technical Library, U.S. Army Infantry Center, Fort Benning, Georgia.

[14]Marshall, pp. 37-47.

[15]Marshall, pp. x-xi, 9, 11, 13-14, 18-19, 22-23, 31, 35-36, 47-52, 58, 65-68, 83-84, 89-90, 92-93.

[16]Lothian, "The Load Carried by the Soldier."

[17]Ibid., pp. 54-55.

[18]USAICDA, "A Study to Reduce..." p. 3, 5, 12, 23, 24, C-11, C-39, E-4, F-5, F-8.

[19]USACDC, "A Study to Conserve..." p. 1.

[20]Ibid., pp. 1, 3, 15.

[21]Ibid., pp. F-1, F-2.

[22]Ibid., pp. 1, 6, 12, 15, H-1, I-2.

[23]USANL, "The Carrying of Loads..." p. 1.

[24]Ibid., pp. 13, 24, 26, 27.

[25]Ibid., p. 32.

[26]USANRDEC, "Technology Demonstration..." pp. 4-5, 10-11.

[27]USANRDEC, "1988 Anthropometric Survey...," p. 320.

[28]M. Hastings and S. Jenkins, The Battle for the Falklands. (London: W.W. Norton & Co., 1983), pp. 231-232, 263-269, 274, 319-320.

[29]Major General J. Thompson, The Lifeblood of War: Logistics in Armed Conflict. (London: Brassey's, 1991) pp. 207, 311.

[30]Major M. Adkin, Urgent Fury: The Battle for Grenada. (Lexington, Mass.: Lexington Books, 1989), pp. 140, 208, 222, 254.

[31]Dubik and Fullerton, p. 39-40.

[32]T. Donnelly, M. Roth, and C. Baker, Operation Just Cause: The Storming of Panama. (New York: Lexington Books, 1991), pp. 76, 225-6, 317, 319, 332, 346-347, 359.

[33]Center for Army Lessons Learned (CALL), U.S. Army Combined Arms Command (Fort Leavenworth, Kansas) bulletins #1-88, pp. 13-19 and #90-9, pp. I-19.

[34]JRTC data.

[35]Information provided by Directorate of Combat Developments and Dismounted Battlespace Battle Lab (DBBL), U.S. Army Infantry School, Fort Benning, Georgia, 1994.

[36]Soldier Modernization Plan: Executive Level Review, USAIS, 19 December 1991.

[37]Information from DCD, DBBL, USAIS.

[38]Infantry. U.S. Army Infantry School: Fort Benning, Ga. Numerous articles reviewed, see bibliography.

[39]Colonel D. H. Wayne and Major W. E. Burke, "Doing Something for the Soldier Every Day," Army Logistician. March-April 1994, pp. 2-5.

[40]Marine Corps Gazette. Quantico, Virginia. Numerous articles reviewed, see bibliography.

CHAPTER THREE

RESEARCH DESIGN

> The CSS issue that has the greatest impact on the rifle company's tactical operations is the soldier's load.[1]
>
> FM 7-10, 1990

Methodology

This chapter presents the methodology used in the study. A graphic depiction of the process is shown at Figure 1 on the next page. The available literature was the starting point to determine what factors cause or contribute to soldier over-loading.

Information Sources

Much of the research was conducted through the Combined Arms Research Library (CARL). Additionally, the Donovan Technical Library (DTL) at Fort Benning's U.S. Army Infantry School (USAIS) was very helpful. This library has a wealth of information on this subject which were made available through inter-library loans arranged by CARL.

Also of great service were the Directorate of Combat Developments and the Dismounted Battlespace Battle Lab at USAIS and the Army's Natick Research, Development,

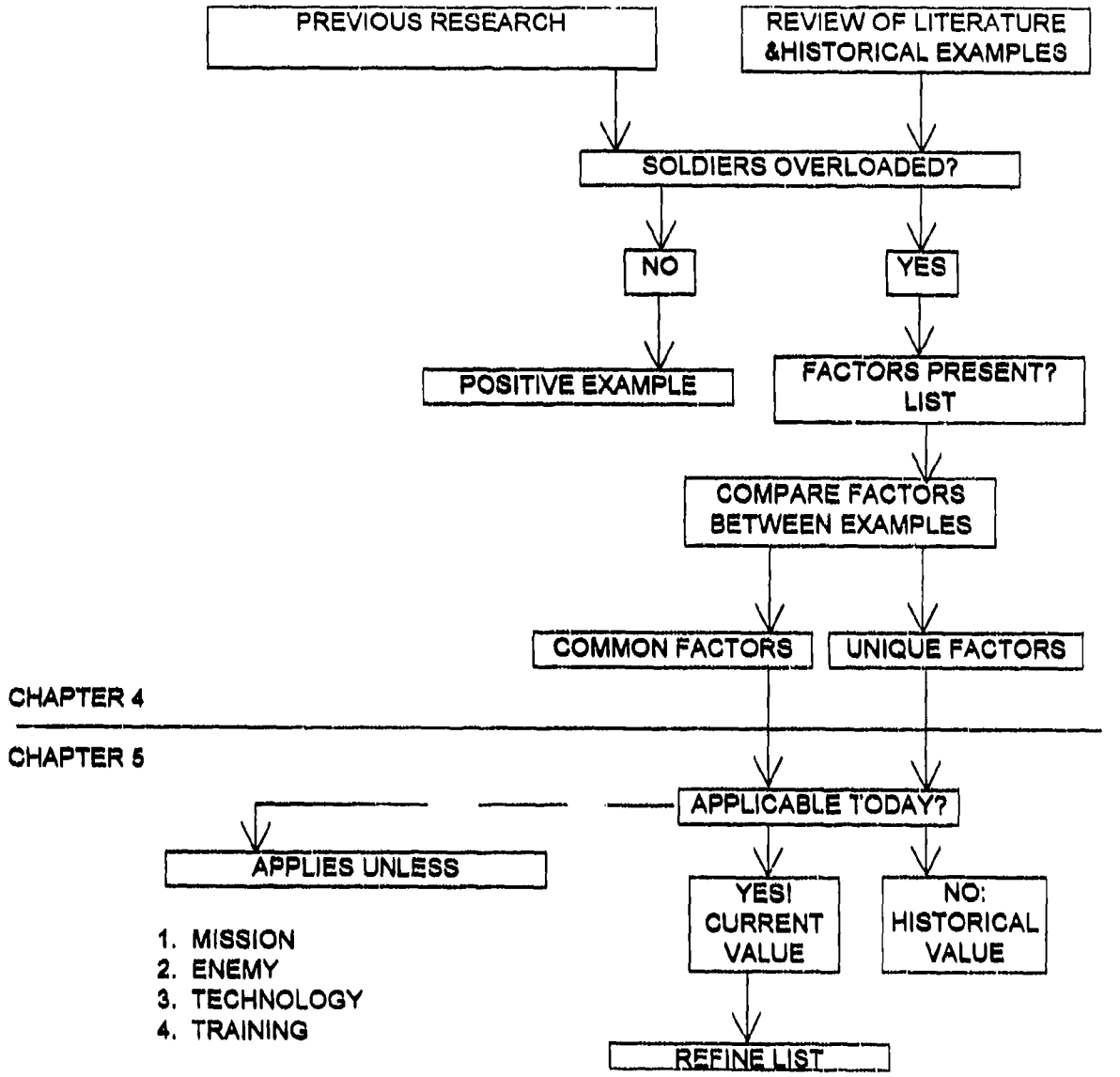

FIGURE 1: RESEARCH METHODOLOGY

and Engineering Center. The first two agencies have leading roles in the Army in establishing requirements and guiding the development of concepts and equipment for the Dismounted Combat Soldier. The soldier's load is a major focus for them on a full time basis.

Natick works closely with the agencies at USAIS in the actual development and testing of new concepts and equipment. Natick provided a great deal of technical data to support this study.

The Army's light infantry training center--the Joint Readiness Training Center--was especially helpful. They observe an average of eight light infantry brigades annually in very intense and dynamic simulated combat operations. The training is as close to combat operations as is possible in peactime and commanders are encouraged to be innovative as they fight. The JRTC observer/controllers (O/Cs) sample the weights of soldiers and their equipment before a mission and this information is available to the rotational unit and the rest of the Army.

The CTC observations are available to the rest of the Army by way of the Center for Army Lessons Learned (CALL). Part of the Combined Arms Command at Fort Leavenworth, CALL is the repository of after-action comments and lessons learned from all major training exercises and combat operations. CALL publishes an update

bulletin several times a year with the latest observations from recent operations.

Information Types

From the sources described above, the study examined many different information types; the most significant of these are reviewed in Chapter Two. These sources included U.S. Army field manuals, books on soldier's load, infantry, and modern combat actions, results of scientific studies and technology reviews, combat observation reports, records of interviews, writings of military historians, articles in military professional journals, CALL bulletins, inter-agency memorandum, and various information, raw data, and briefing packets provided the information sources cited above.

Review of Information and Findings

After gathering source information, the next step in the methodoloy was to review previous soldier's load research to determine factors previously identified. The study then examined information from the other types of sources, with emphasis on examples of overloaded soldiers, to isolate the causative factors or trends.

Information from positive examples of soldier's load, illustrations of leaders and units properly tailoring

their loads, was considered primarily as background material only. These examples were material to the primary focus of this study, the identification of factors causing overload, mainly in the way in which they demonstrate how units or leaders avoided or negated an overload-causing factor or factors.

Having developed this initial list of factors by source, the list was integrated into a matrix so that similarities and differences would be more readily apparent. The purpose of the matrix was to organize the information and identify factors that were common among the sources and those that were unique or uncommon. The analysis of this information and the initial matrix (Figure 2) are contained in Chapter Four.

Analysis and Conclusions

Chapter Five continues with an evaluation of the findings of the research in Chapter Four. The purpose of which is to determine the current applicability of the factors discovered. This evaluation is made by comparing the factors against the criteria of Mission, Enemy, Technology, and Training as they are discussed in FM 100-5, Operations and FM 25-100, Training the Force.

Criteria

The first criterion used to determine whether a discovered factor is applicable today is mission. Specifically, is the factor related to a mission, task, or role that is likely to be performed by American dismounted combat soldiers in the foreseeable future? The factor is no longer applicable if the mission, task, or role is one that is not currently part of U.S. doctrine. The factor is valid by this criterion if today's forces practice the particular mission as a function of current doctrine.

The second criterion for judging applicability is the enemy. Was previous enemy doctrine, tactics, techniques, procedures, decisions, or other influences a cause for the discovered factor? Does the same or a similar enemy exist in today's threat enviroment? The factor is no longer applicable unless a threat exists with similar capabilities, doctrine, organization, tactics, techniques, or procedures.

Thirdly, the study examines the findings in view of technology. The factor is no longer applicable if a technology currently in service with dismounted soldiers has overcome or negated the situation or circumstances creating the factor.

The last criterion used to evaluate the applicability of the factors is training. Was the factor a

result of specific training doctrines or events or their absence? Have modern advances in training made the factor obsolete?

Conclusions

The conclusions provide a current and applicable list of factors that cause or contribute to soldier overload. Where insufficient evidence was available to positively identify a factor, the trend in the evidence is discussed to aid in future study.

Endnote

[1]FM 7-10, p. 8-1.

CHAPTER FOUR

RESEARCH ANALYSIS

> The number of tasks that soldiers fail to accomplish at JRTC, to an acceptable standard, can be directly related to the soldier being too physically tired or mentally unwilling to put forth the effort --Because of their excessive loads and the chain of command can't break the code on how to make the system work.--And that's a fact![1]
>
> Anonymous at JRTC

From the literature reviewed it is possible to compose an initial listing of soldier's load factors. Figure 2 provides a matrix which shows the major sources reviewed and the soldier's load factors addressed in each.

This chapter describes each factor in general terms and provides supporting examples to illustrate them. The matrix at Figure 2 also shows which factors appear repeatedly across a broad spectrum of source material, indicating widespread acceptance, and those that appear once or in only a few sources, indicating a trend. The conclusion provides an outline list of soldier's load factors.

FACTORS CAUSING SOLDIER'S OVERLOAD

SOURCES \ FACTORS	LACK OF APPRECIA-TION FOR PROBEM	EFFECTS OF FEAR AND UNCERTAIN-TY	FEAR OF RISK	THE FIRE LOAD	THE DRAG OF ORTHODOXY	DISCIPLINE AND THE ENFORCE-MENT OF STANDARDS	NATURE OF THE SOLDIER	LACK OF TRANS-PORT	MYTHS OF PEACE-TIME TRAINING	EFFECTS OF TECH-NOLOGY	TERRAIN AND WEATHER	PHYSICAL CONDITION-ING
SLAM: SOLDIERS LOAD	X	X	X	X	X	X	X		X	X	X	X
BAKER, DONNELLY, ROTH: OPERATION JUST CAUSE		X				X	X	X			X	
HASTING AND JENKINS: BATTLE FOR FALKLANDS		X						X	X		X	X
CALL	X	X	X	X	X	X		X	X		X	X
DUSIK AND FULLERTON: OVERLOAD IN GRENADA	X	X	X				X				X	
ADKIN: URGENT FURY	X	X	X	X				X	X		X	
THOMPSON: LIFEBLOOD OF WAR				X					X			
NATICK ('73 '88)								X		X		
JRTC	X		X		X	X	X	X	X	X	X	X
USAIS (DCO, DDBL)	X				X	X		X	X	X		
USAISDA '62	X	X	X	X	X	X	X	X		X		
USACDC '64	X		X	X	X	X	X	X		X		
INFANTRY MAGAZINE	X		X					X	X	X		X
# OF SOURCES	9	7	8	6	6	7	6	10	8	7	7	5

FIGURE 2: SOURCE-FACTOR MATRIX

METT-T as a Factor

In a hypothetical sense, a commander making an ideal estimate of the situation will arrive at precisely the proper load to be carried by his soldiers without shortage or excess. An accurate mission analysis will permit the unit to carry only enough equipment to accomplish the precise tasks assigned. The enemy threat will have been properly assessed and the exact numbers and types of weapons, munitions, and protective equipment needed will be known. The staff will be able to accurately predict the conditions of weather and terrain, their effects on the unit and the operation, and the equipment necessary to negotiate these conditions. The commander will know his troops completely. Their level of training, stress tolerance, and limits of their abilities will be within the constraints of the task. Finally, sufficient time will be available to accomplish load tailoring and effect resupply as necessary later.

However, this estimate is performed by humans and military operations are rarely conducted in ideal conditions. Because of this, other factors impact on the decisions that effect the soldier's load. This chapter explores those factors.

Appreciation for the Problem

The factor of appreciation for the problem has two different components. First, a basic awareness of soldier overload, what causes overloading, and the problems it creates. Secondly, an understanding of the methods available to avoid, correct, or reduce the scope of the problem.

Many leaders are aware of the hazards of soldier overload and understand the doctrinal methods to help control the problem. But, due to the outcome of their command estimate, they sometimes make the conscious decision to exceed the doctrinal load guidelines. This section addresses the problems that result when leaders don't have this base-line appreciation.

Lack of Awareness

Marshall referred to this as "ignorance of the problem." He discusses the leader who is ignorant of, or indifferent to, the effects over-loading has on soldiers and tactical operations. One of the sources of leader education and development is familiarity with service doctrine and it is noted that at the time of Marshall's writings, little written or formalized existed.[2]

Some of the conclusions from the Infantry Combat Developments Agency study conducted in 1962 were that the

major causes of overloading included commander's and staff's lack of awareness of the problem and inability to heed the lessons of history (the study recommended soldier's load instruction for all levels of military education up to and including the War College).[3]

One of the tasks of USAIS is to train and educate all U.S. infantry soldiers, non-commissioned officers, and officers. According to a recent inquiry made of the Directorate of Training, there are presently no scheduled primary training hours on soldier's load in the programs of instruction for either the Infantry basic or advanced NCO and Officer courses. Similarly none of the primary training includes soldier's load as a planned discussion item on the lesson outline. Soldier's load considerations are discussed only as secondary points to other blocks of instruction such as patrolling or movement techniques.[4]

Inability to Resolve

Once a leader understands the facets of the problem, he must then demonstrate the ability and willingness to act on his knowledge. Operational observations by the JRTC's O/C's note that often units do not attempt to adjust, cross-level, or cache equipment once in their area of operations; even after noting undue fatigue early in a movement and correctly attributing it to

heavy loads.[5] The 1962 USAIS study noted that some commanders who were effective in reducing soldier's loads for an attack were prone to ignore the excess weight during the approach march to the objective and the attendant loss of energy required for the attack.[6]

The Effects of Fear, Fatigue, and Uncertainty

Perhaps Marshall's strongest message is the lack of appreciation, by tactical leaders, for the debilitating effects of stress and fear on the average soldier and its resulting effect on his ability to carry a load. Recognized by our Army and incorporated into its soldier's load doctrine is Marshall's conclusion that the soldier's load causes fatigue which reduces his ability to deal with the stress caused by normal battlefield fear. In turn, this fear induced stress rapidly tires the soldier, sapping his strength, and reduces his ability to carry his load. This vicious fatigue-fear-fatigue cycle, rarely observable in training exercises, can debilitate even the best-trained and well-led soldiers and must be considered by the commander entering battle. Marshall sums it up this way,

> Tired men take fright more easily. Frightened men swiftly tire.[7]

Sergeant Bruce Heisley, Co. E, 16th Infantry, attacking Omaha Beach expressed the phenomena well:

> ...I didn't know my strength was gone until I hit (the) beach. I was carrying part of a machinegun. Normally, I could run with it. I wanted to do so now but I found I couldn't even walk with it. I could barely lift it. So I crawled across the sand dragging it with me. I felt ashamed of my own weakness.[8]

Although Marshall focused on the simple fear of death or wounding, others have expanded this discussion to include the more subtle effects that uncertainty plays. This factor of uncertainty--a fear causing leaders of soldiers to take extra items--is, closely related to but, subtly differently from the fear of risk which prevents soldiers from leaving items behind.

An after-action summary of problems plaguing U.S. forces during the 1983 invasion of Grenada included "overburdened infantry." One reason for this problem was the tremendous level of uncertainty facing the invaders due to an incredible dearth of credible information on the numbers, capabilities, and intentions of the Grenadian and Cuban enemy. This uncertainty, combined with a lack of combat experience at the tactical level in the American ranks, caused commanders, planners, and soldiers to hedge their preparations--packing extra ammunition and grenades.[9]

In a Grenada study performed by Walter Reed Army Medical Center, Majors Dubik and Fullerton reached the conclusion that "uncertainty" was a factor that caused

soldier overloading in Grenada. Uncertainty caused by a lack of operational information, rapidly changing information, lack of common training and SOP's between some units, and a lack of trust in the capabilities of other units or of the "system" to provide for needs. This uncertainty caused the initial units to pack for the worst.[10]

The factor of uncertainty also played a role in increasing the soldier's load in Panama. Fear of the unknown and concerns about resupply caused soldiers to make second trips to the ammo issue point. One brigade of the 7th Light Infantry Division was forced to carry more than it would have liked and even forage locally due to the occasional uncertainty about resupply.[11] In it's post-Just Cause bulletins, CALL stated that uncertainty over the threat, nature, and duration of missions has caused soldiers to deploy with twice as much ammunition as was needed and with unnecessary comfort items.[12]

Fear of Risk

In the military, "risk" is often defined as the voluntary exposure to danger. Military leaders must take risks everyday to accomplish tasks with insufficient resources. However, these same leaders are often unwilling to take risks to insure that their soldier's fight light.

The very essence of this risk-taking is the decision to leave certain items of equipment and supplies behind so the soldier's load is tolerable. As Marshall pointed out, the leader cannot equip his troops for every possible contingency. Based on his assessment of METT-T, the commander must be willing to pack only what is absolutely required and leave the rest for transport by other means. The risk is that he will leave something his soldiers will need; the consequences are that his unit may fail to accomplish its task or his soldiers may suffer. Because of these consequences many commanders, and their staffs, are unwilling to accept the risk and thus send their soldiers into battle overloaded.[13]

Marshall called this phenomena the "fears of the staff." This fear took many forms and is often accompanied by the thoughts that "nothing is too good for our men" and a "rule of safety" should be observed. That is to say, "our soldiers might _____ so, to prevent this, they should carry _____." (The commander or staff officer inserts the appropriate words to justify an addition to the packing list: e.g., "go hungry, extra rations" or "get cold, extra blankets."

These "fears of the staff" are obvious when commanders and their staffs feel that their judgment will be called into question if a soldier should complain about hunger due to a missed meal or should suffer frost nip from

a cold night spent without a blanket. The overly-concerned staff finds that a simple and "risk-free" solution, especially during training, is to require every soldier to carry all that he might need for his comfort!

Marshall noted that this line of thinking causes overloaded soldiers in combat because these actions, pre-conditioned by training, cannot be overcome by the fact that the unit is now in battle (in modern jargon, we will fight as we have trained). He went further to say that a more proper "rule of safety" would be observed if commanders and staff officers would recognize that in combat they are safer to equip their soldiers to fight with agility and accept the risk that they may get cold or miss a meal because of it. He concluded this point by noting that soldiers that are well-trained and led, and that understand the reasons for their temporary hardships will not complain unduly and in fact, bond as a unit even more tightly because of it.[14]

Some more recent examples include a mention of risk analysis in the 1962 USAIS study. The study made the interesting observation that killing power should have primacy over troop protection requiring commanders to consider risk to prevent the latter from degrading the former.[15]

Interviews with Rangers who parachuted into Panama note that task analysis plays a key role in determining the

equipment needed for a mission and thus, risk. Identifying specific tasks to be performed during an operation permits a determination of the specific number or amount of equipment to be taken. One Ranger recalled that he carried a chain saw to cut down a fence on his objective. The fact that he was a large man showed proper consideration of the relationship between body weight and load carrying capacity. However, the fact that he was also a machinegunner showed a lack of consideration of the weight of his weapon and ammo in determining who would carry the saw. The soldier related how his heavy load and hard landing left him somewhat disoriented after touchdown.[16]

Commenting on the dilemma over the decision whether or not to wear body armor on operations, CALL bulletins note that leaders must evaluate and accept or refuse risk with regards to protective armor versus agility and heat stress.[17]

The Fire Load

This factor address the predictable occurrence that soldiers will often go into battle overloaded with a great deal more ammunition than they will need. General Marshall explored the problem of soldiers overloaded with ammunition (he called it the "fire load"), noting two main reasons for this phenomena. The first is the false belief that giving the soldier heavy loads of ammunition is good

for his morale. The second reason is the notion that shortages of ammunition regularly lead to tactical defeat on the modern battlefield.

Marshall also wrote about the belief of some commanders and staffs that soldiers must be prepared for every possible eventuality in order to "protect" them. This factor applies to the problems associated with issuing too much ammunition as well as requiring other items of equipment.[18]

An example he used to illustrate the problem is the distribution and use of hand grenades during World War Two. Many units reduced the soldier's load of rifle ammunition, although not for the purpose of lightening his burden, in order to permit him to carry more grenades. Marshall's interviews showed that although most men were issued between five and eight grenades, less than six percent of the soldiers ever threw them.[19]

Although Marshall's conclusions on fighting and fire have drawn the most criticism from his detractors, it is not difficult to argue that the issuance of grenades was based more on the prevailing conventional wisdom than on mission requirements or usage rates.

The commander of the 82d Airborne Division's lead battalion to relieve the Rangers on Grenada directed that his soldiers draw a double basic load of ammunition. He

regretted this decision later as he watched the men staggering with their rucks to the aircraft.[20]

These experiences have pointed out the necessity to establish and enforce a strict Standard Operating Procedure (SOP) for the amount of ammunition a soldier should carry. The authors recount interviews with members of two different companies from one of the battalions of the 75th Ranger Regiment.

One company, whose commander had participated in Operation Urgent Fury, the invasion of Grenada, and observed the problems of overloaded soldiers in combat, insured that his soldiers took only their prescribed basic load. A sister company allowed the soldiers to return, after the basic issue, to the huge pallets of ammo lining the airfield and draw additional ammo and grenades as they desired. A sergeant in this company later estimated that his ruck weighed 80 pounds and he needed assistance carrying it to the plane.[21]

The Drag of Orthodoxy

This factor is rooted in the conservative and tradition-minded military culture that tends to regulate and standardize many routine procedures. Marshall referred to this tendency as the "drag of orthodoxy." This factor

has two components. The first of these is conservative mind-set of the military leader.

Marshall explored the effects that traditional thinking and resistance to change have on the soldier's load. The military, as a conservative institution, is slow by nature to adopt change even after lessons learned in battle point out a deficiency. He also noted that military leaders are inclined to heed the dictums of successful leaders that preceeded them, especially if these pronouncements come from the Great Captains of history. This difficulty to challenge accepted maxims exists even in light of an "ever-broadening human experience.[22]

One example is the proverbial last resort of the infantry--the bayonet. Marshall blamed the continued existence of the bayonet on tradition and the superstition that its possession makes troops more "fierce and audacious." Acknowledging some usefulness in physical and mental conditioning, Marshall stated that the Army needed to re-evaluate the utility of the bayonet from a purely utilitarian and analytical point of view without sentiment whatsoever. His bottom line--the bayonet is two pounds that the soldier can do without![23]

Similar thinking was displayed in the 1962 USAIS study that noted tradition and resistance to change were keeping the soldier overloaded and used the bayonet as an

example of an item's tactical value failing to justify its weight.[24]

The second component to the drag of orthodoxy is the "tyranny of the SOP." This exists when a leader cites an existing SOP or packing list without applying the variables of METT-T in his planning to determine if the loads are appropriate for that operation. The SOP is designed to facilitate routine packing of the soldier's load but must always be reviewed each mission. The fact that many unit SOP's are written for the worst-case scenario or to facilitate field training only exacerbates the problem.[25]

An example of this factor is seen in some of the six battalions of the 82d Airborne deploying to Grenada in 1983. It was nearly November at Fort Bragg and the division was packed in accordance with its standard winter packing list. When units began deploying for the tropical combat zone, some thinking commanders dramatically tailored their loads. However, other units deployed "by the book" and it was not unusual to see piles of sweaters, long underwear, and even sleeping bags at Pope Air Force Base and around the airhead at Point Salines.[26]

The chain of command often does not take personal action to review or inspect the packing list--often simply referring to the unit's SOP and making no effort to eliminate unessential items or cross-level equipment based

on mission loads. The results: Soldiers carrying 10 MREs because the unit's first planned resupply is three days away; machinegunners, among the most heavily laden, carrying additional medical kits because they happen to be the qualified combat lifesaver; spare uniforms in case a soldier tears his clothing or he gets wet; soldiers with two rainsuits (the obsolete-yet-still-issued rubberized suit they are required to have to be "uniform" and the superior, Army-authorized but personally-purchased, goretex parka that many units won't permit the soldier to wear because "everyone doesn't have one").[27]

Discipline and the Enforcement of Standards

At the opposite end of the spectrum from the previous factor is the failure of leaders to determine what weight their soldiers should carry, provide clear guidance in the form of a mission-designed packing list, and to enforce that packing list through rigorous inspection.

Marshall found that units that did establish a packing list frequently caused more harm than good by directing the packing of items that were neither required by the soldier or the mission. In illustration, Marshall recounted the story of the 153rd Infantry Regiment's assault on the Aleutian island of Kiska. The unit's long packing list included a "Book of Battle Songs!"[28]

Our modern army still has the same problem. CALL bulletins have included similar entries in recent years. Among these were: some commanders do not understand the importance of their role in establishing and enforcing soldier's load standards; unit SOP's often do not address soldier's load concerns; although pre-combat inspections (PCI) are critical, leaders routinely fail to inspect their soldier's rucks.[29]

Common at the JRTC are units that "talk soldiers load" up and down the chain of command. But when the troops cross the line of departure, the average rifleman's load still weighs 100.72 pounds. The observer/controller's inspections reveal rucks laden with extra fatigue uniforms, galoshes, candy, paperback books, playing cards, cameras, extra food (several days worth of MRE's or civilian food in addition to their Army rations), multiple rainsuits and flashlights, and troops carrying multiple weapons (The pistol is not a MILES-capable weapon. At JRTC, soldiers armed with pistols by TO&E often carry an M16 rifle as well).[30]

Nature of the Soldier

Another factor to consider is the nature of the soldier. This factor has two aspects. The first of these

is the tendency of the inexperienced soldier to collect, hoard, and carry everything he finds of interest, is issued, or is directed to take. Marshall suggests that this is caused by the simple fact that soldiers are "packrats" by nature and, until they become more experienced, are also concerned they will meet disciplinary action if they should lose or fail to carry some item.[31] A 1973 study done by Natick Labs validates the conclusion that inexperienced soldiers initially tend to carry too much when left to decide for themselves.[32]

The corollary is that when the soldier faces the real-life challenge to carry his load or die, he quickly gains the experience to discern between what is necessary and what isn't. If the chain-of-command fails to tailor the soldier's load, the soldier will do it himself, on the battlefield, by discarding what he feels he must. The obvious problem here is that the soldier is making the choices and the items chosen may include essential equipment or supplies. The only way the leader can effectively control this is to insure his soldiers carry only the absolute essentials and that any discarding of equipment must be controlled by the leaders.[33]

The Lack of Transportation

As stated in doctrine, the commander is responsible for arranging the transport of any components of the soldier's load that are not carried by him. This necessitates some means of transportation and bodes ill for the soldier's back if transportation is in short supply.

In the Falklands campaign, the heavy burdens of the British infantry units were a function of a lack of strategic lift to move the fighters and sufficient support assets to the scene of the conflict. This was compounded by the terrain (marshy bogs and hills with few roads) and weather which rendered most vehicles useless and often grounded helicopters. Further exacerbating the situation were the losses of essential helicopters and fuel stores due to Argentinian air attack. The end result was soldiers forced to march on foot carrying almost everything they needed on their backs.[34]

One year later in Grenada, the scarcity of strategic lift and need for speedy deployment coupled with the limited capability of the reception airfield on the island caused the units of the 82d Airborne Division to deploy "light"--meaning without their normal complement of supporting vehicles and man-packing their equipment. The result was actually anything but "light." Units that had trained to transport portions of the soldier's load and

vital stores on their organic vehicles were now forced to deploy and fight without them. The paratroopers were "frequently grossly overloaded" greatly reducing their mobility. Some innovative commanders corrected this problem by commandeering civilian vehicles and using captured enemy trucks.[35]

After-action comments from Panama show how an overall lack of sufficient lift assets placed greater burdens on units and ultimately on the soldier. Due to space, operational security, and time constraints units suffered from a lack of adequate strategic and theater lift, helicopters, and trucks to provide logistics and mobility as units and training procedures were designed. Instead, units were continually forced to "make do" with what was available and the end result was almost always a heavy rucksack on the soldier's back.[36]

These trends continue in our training exercises to this day. In an era of aircraft shortages and fiscal constaints, units must often choose between deploying the command and control and fighting vehicles, that maneuver during the exercise, or the support trucks. Recent CALL reports note that a lack of support vehicles increases the load; and often we do not task the logisticians to assist our tactical commanders in getting their loads forward.[37]

The Myths of Training

This factor addresses the inadequate, and sometimes incorrect, soldier's load lessons that we routinely draw from our training experiences. One very real problem is thinking that a soldier or unit's capabilities in peactime are equivalent to their expected capabilities in combat. Marshall suggests that this statement does not account for the loss of physical strength caused by battlefield fear and is reinforced by the way in which we train.[38]

The first of these training deficiencies is in preparing our soldiers to carry heavy loads. Peacetime maneuvers cannot replicate the energy drain that fear creates in combat. The 1973 Natick Labs study concludes that basing combat estimates and plans on load carrying experience developed in peacetime is potentially hazardous.[39]

Marshall planted the seeds of today's notion of "training heavy" but "fighting light." He advocated training to the widely accepted load standard of 30% of body weight (or even slightly heavier is permissible) but endeavoring to fight in only 80% of the training load to compensate for the fear-fatigue phenomena that is impossible to replicate in training.[40]

A second training issue is the way in which we structure exercises and the expectations this leads

commanders to have of their soldiers in training and war. Marshall observed that training exercises are often deliberately sheduled to be very ambitious in their accomplishments. The reason is to insure that the force gets maximum benefit from the training opportunity--"a proper workout." But when commanders, staffs, and soldiers are not warned that, in combat, their goals would be much more modest, a false perception is created that what is possible on exercises is equally possible in battle. Over time, the combat-experienced veterans grow fewer in number and the myth of our capability, created in peacetime, is perpetuated as the expectation for battle.[41]

Due to the high costs and complications of large scale field exercises, companies and battalions often train alone or with only a portion of their wartime augmentation. They learn to "make do" without much support because they don't train with it. As a result, sometimes when divisions go to war the support resources of the division are not coordinated to fully assist the brigades. Vehicles and services that could assist the regiments and battalions with their burdens may be doing other less critical tasks. Noteworthy here is the notion that load management is not just company or battalion level business but also regiment and division level.[42]

Other studies have concluded that a distinct lack of confidence in the ability of the supply trains to "make

it happen" when needed resulted from problems in training.[43] The British, making the same observation during their operations in the Falklands, noted that contributing to the soldier's burden were the logistical difficulties caused not only by the lack of resources and transport but also by their lack of exercise in peacetime. It was observed that training exercises are normally aimed at honing the "teeth" of an army and less on preparing the "tail."[44]

Retired British General Julian Thompson called these the "false lessons of peacetime training"--lessons that bear on the burden of the individual soldier. Among these is the lesson that small wars and most exercises, emphasizing maneuver forces and operations, do not adequately test or prepare the logistics system. Rarely are commanders forced to choose between moving men or supplies. In war, if transport is limited, men will march carrying some of their supplies and the available transport will be busy moving the rest. Thompson also notes the similar deficiencies noted during computer simulations or command post exercises designed to test procedures and communications. He suggests that it is much easier to coordinate the "notional" logistics found in simulations than it is the actual.[45]

The Effects of Technology

The role of modern technology has garnered great publicity in the wake of Operation Desert Storm. A major purpose of technological advancement in our Army is to make the organization more efficient in accomplishing its mission in terms of cost, casualties, time, and resources. In the area of soldier's load, the goal of technology is to find ways to reduce the burden of our already-overloaded dismounted combat soldiers.

Technological innovation has achieved some reductions in soldier's load in the past. One example is the use of nylon in the construction of load bearing equipment as a replacement for cotton webbing. This resulted in a 36% reduction in weight when dry, even more when wet.[46] Another positive example is the replacement of the canned "C-ration" with the much lighter Meal-Ready-to-Eat (MRE). However, more often than not, technology works to increase the soldier's load rather than reduce it.

One way technology increases the soldier's burden is by creating a capability that did not exist before. Sometimes this is in response to a perceived or real threat, sometimes it is caused by a simple breakthrough in capability. In either case, the end result is usually some item, with some mass, that must now be carried by the soldier.

An example of responding to the threat is the chemical protective mask. Developed in World War One to counteract the specter of chemical warfare, the gas mask has become an almost standard part of our battle uniform--at a cost of three pounds.[47] Two examples of breakthrough technology are night vision devices and the global positioning system. Both items were developed to give our Army a technological edge rather than respond to a specific enemy threat. They have become almost indispensable to the way we fight, and each have added between two and three pounds to the rucksacks of many soldiers.[48] In both of the preceding examples, the technology introduced was a positive aspect but the added weight, any added weight, is bad for the already overloaded soldier.

Another example of emerging capabilities, the Infantry School's Enhanced Land Warrior project proposes to greatly increase the capabilities of the individual soldier and dismounted units by leveraging advanced technologies for communications and information management. However, the new equipment to make this leap ahead--miniature video cameras, helmet-mounted visual displays, thermal weapons sights, and individual soldier computers--are additional items, and weight, that the soldier will have to carry.[49] What impact will this have on mobility?

A second way in which technology negatively impacts on the soldier's load is when the load is lightened but the gain is lost to an increase in requirements. It might be argued that this is more properly a function of leader decision-making but these decisions are triggered by technological advance nonetheless. In a 1964 study, the Army recognized that technology would allow the development of a composite fiber helmet and protective vest that would provide the same or slightly better protection for a significant weight savings over the current versions. The alternative was a vastly increased level of protection for approximately the same weight. The study concluded that weight reduction, and thus increased agility and killing power, should have primacy over troop protection. This required commanders to consider risk to prevent too much protection from degrading agility and killing power.[50]

This recommendation actually resulted in the present-day kevlar helmet, providing much greater protection than its steel predecessor but weighing an additional one-third pound in its most common sizes; and the kevlar vest, offering somewhat greater protection than its precursor but also weighing an additional one-half pound.[51]

Related in nature, but more frustrating in the outcome, is new but heavier technology that replaces an existing item, with only slight or no significant

improvement in capability. An example is the Army's new wide-field-of-view, rubber-armored, European-made binocular that replaces the older version but is more bulky and 10% heavier.[52]

A less obvious way in which technology has increased the soldier's burden is through "load creep"--the increase of the rucksack load as a result of secondary consequences of other decisions system-wide.

Load-creep manifests itself in several ways. One of these ways is the decision to lighten not only the soldier but the Army as a whole. A historical example is Napoleon's support of the invention of canned meat. Operationally it made his army lighter by reducing his logistical tail and his dependence on huge herds of livestock. Tactically, his soldier's felt the new burden of glass and metal food containers in their haversacks.[53]

A more modern example is our efforts to "lighten the force" and create a strategically mobile light infantry division. The lightness of the division came, in part, from its lack of supporting vehicles and aircraft. This stategic agility translated into heavy rucks due to the lack of tactical transport.[54]

Load creep can also be found in the way we develop and acquire our equipment. Excessive requirements for durability and quality usually insure that the soldier gets a piece of equipment that is more sturdily constructed

(thus heavier) than actually required. A 1964 study considered the effects of durability and functional requirements on item weight. It recognized that items often had durability ratings much longer than their expected combat lifespan. This extra durability usually meant that the item was heavier and bulkier than it needed to be.

A 1988 Natick study notes that many items of soldier equipment are developed one item at a time and in relative isolation from other items. Thus small weight increases are overlooked (what can a couple of ounces hurt?) especially when increased capabilities attend them. The new boot is .7 pounds heavier, the new rucksack is 1.4 pounds heavier, the new gas mask is .8 pounds heavier, the new squad radio is .7 pounds heavier, the new bayonet is .5 pounds heavier, and the new rifle is .3 pounds heavier. Increases that were considered insignificant in isolation quietly added 4.4 pounds to the soldier that already exceeded every weight guideline published![55]

A 1964 Army study recognized that the standard practice of equipping the entire army with uniforms and basic equipment designed for the infantry may be counterproductive. The study concluded that by ignoring the combat life span of infantry items, beefing them up to an item life useful to the army as a whole, the items became heavier and more costly. It proposed that special

items be designed, even at higher cost if necessary, to meet the infantry task and save weight; the increased costs being offset by only issuing these special items to combat infantry units.[56]

A final way in which technology can adversely effect the soldier's load is the old notion that multi-functional items can create weight savings by replacing several items. An Army study in 1962 proposed that a single multi-purpose item, a multi-purpose shelter, could replace the rainsuit, blanket, poncho, and shelter-half.[57] Actual trials of this new item in the mid-80's showed that it actually increased the load by reducing flexibility. Previously a soldier or commander could tailor the load by leaving some of the components behind. With the single multi-purpose item (which weighed less than all four components but more that any two) it was "all or nothing."[58]

Some of the problems blocking more significant progress in cutting weight through technology include funding cuts, the inclination of some decision makers to opt for increased capability over weight savings, and the acceptance of item weights that slightly exceed the limit expressed in the operational requirement. These gains are easier to accept if the item meets all other requirements or if they are compensated by weight savings on other items.[59]

Terrain, Weather, and Physical Conditioning

With the exception of the extremes of cold weather or very rough terrain, which require special items of equipment necessary for mobility and survival, the factors of terrain, weather, and physical conditioning impact more on the soldier's ability to carry his load rather than on the load itself.

Terrain and Weather

These two considerations, part of the commander's METT-T estimate, should also carry significant weight in the commander's decision-making on soldier's load. Difficult terrain and weather extremes impact on the commander's packing list. In the Falklands war the British discovered that the South Atlantic weather played a role in burdening the soldiers. The constant rain and cold temperatures required the soldiers to carry rain gear and enough sleeping bags to protect soldiers from the elements. The rolling, trackless hills and soggy bogs also prevented the most efficient use of what few support vehicles the British did have--increasing the rucksack burden.[60]

In Grenada heavily laden paratroopers and Marines staggered up the jungled hillsides in the tropical humidity--their strength sapped by their burdens, the hills, the heat, and the fear of battle.[61]

During Operation Just Cause a combination of tropical heat and heavy loads was again a significant factor for paratroopers of the 82d Airborne Division. Deploying from Fort Bragg in the midst of an ice storm, the high heat and humidity and their heavy combat loads caused one unit nearly half of their total casualties as they assaulted a Panamanian hilltop stronghold.[62]

Physical Conditioning

A key factor in determining the soldier's ability to carry heavy loads is his level of physical conditioning. Our doctrine recognizes that a man's ability to carry a load can be improved 10-20% with proper training. Beyond this point, no further gains are possible.[63]

The march training programs of the British Marines and paratroopers are legendary and this training paid off in the Falklands. However, the landing force also consisted of mechanized infantrymen that were forced to fight and march without their familiar tracked vehicles. Their lack of comparable preparation for marching with heavy loads was evident when the Welsh Guards were unable to complete their first attempt at a tough march.[64]

Many infantry unit physical fitness programs fail to train for load carrying. Often PT is oriented on

aerobic activity and calisthenic-type exercises. These may be good indicators of overall fitness but are not indicators of load-carrying capacity. Many PT programs in dismounted units focus on passing the semi-annual PT test, some commanders not recognizing the need for a ruck marching program as well.[65]

The British experience in the Falklands echoes the notion that training for load-carrying requires specificity and doesn't necessarily correlate to other types of training often associated with soldier fitness. The British Army has unit-level PT instructors in their infantry battalions. These NCO's are normally very fit, doing a great deal of running, weightlifting, and eating a diet of low-fat, high protein food to build lean muscle mass. It was a matter of some surprise when it was discovered in the Falklands that the PT instructors had a harder time with the marches. The British concluded this was due to the sudden change to a field ration diet and the fact that they normally did far less marching than the line company men in training.[66]

The factors depicted at Figure 2 summarize the analysis of this chapter. The figure retains the factors of terrain, weather, and physical conditioning due to the equipment requirements for operations in extremely rough

terrain or severe weather and the critical link that physical conditioning has with a soldiers ability to carry his load or improve to carry heavier loads.

Endnotes

[1]Quotation from unknown soldier at JRTC from information supplied by CALL.

[2]Marshall, pp. 22-23, 35-36, 52-53.

[3]USAICDA, "A Study to Reduce...," pp. 3, 5, 23, 24.

[4]Information from DCD, DBBL USAIS.

[5]CALL bulletins #1-88, pp. 13-19 and #90-9, pp. I-19.

[6]USAICDA, "A Study to Reduce...," pp. F-5, F-8.

[7]Marshall, pp. 36, 41, 46.

[8]Ibid., p. 43.

[9]Adkin, pp. 140, 208, 254.

[10]Dublk and Fullerton, p. 39-40.

[11]Donnelly, Roth, Baker, pp. 317, 332.

[12]CALL bulletin 90-9, p. 1-19.

[13]Marshall, pp. 7-10, 30.

[14]Ibid., pp. 57-59, 69-70, 92-93.

[15]USAICDA, "A Study to Reduce...," pp. C-11, E-4.

[16]Donnelly, Roth, Baker, pp. 346-347.

[17]CALL bulletins #1-88, pp. 13-19 and #90-9, pp. I-19.

[18]Marshall, pp. 18-19, 30-31, 58.

[19]Ibid., pp. 12-13.

[20]CALL bulleting 1-88, p. 15.

[21]Donnelly, Roth, Baker, p. 332.

[22]Marshall, pp. ix, 8.

[23]Ibid., pp. 14-15.

[24]USAICDA, "A Study to Reduce...," pp. 12, 23, C-39.

[25]USAICDA, "A Study to Reduce...," p. 23 and briefing packets from USAIS and ADEA.

[26]CALL bulletin #1-88, p. 15 and author's personal experience.

[27]JRTC data.

[28]Marshall, pp. 31-33, 89-90.

[29]CALL bulletins #1-88, pp. 13-19 and #90-9, pp. I-19.

[30]JRTC data.

[31]Marshall, pp. 64-67.

[32]USANL, "The Carrying of Loads...," pp. 13, 24, 36.

[33]Marshall, pp. 64-67.

[34]Hastings and Jenkins, pp. 231-232, 263.

[35]Adkin, p. 222.

[36]Donnelly, Roth, Baker, pp. 76, 317, 319, 359.

[37]CALL bulletins #1-88, pp. 13-19 and #90-9, pp. I-19.

[38]Marshall, pp. xi, 35-36.

[39]USANL, "The Carrying of Loads...," p. 27.

[40]Marshall, pp. 52-70.

[41]Marshall, pp. x-xi.

[42]USAICDA, "A Study to Reduce...," pp. C-11, E-4.

[43]Dubik and Fullerton, pp. 44-45 and briefing packets from USAIS and ADEA.

[44]Hastings and Jenkins, pp. 319-320.

[45]Thompson, pp. 207, 311.

[46]USANL, "The Carrying of Loads...," p. 13.

[47]Marshall, p.11.

[48]Land Warrior Weight Analysis, DCD, USAIS.

[49]Enhanced Land Warrior information from DCD and DBBL, USAIS.

[50]USACDC, "A Study to Conserve...," pp. F-1, F-2.

[51]Land Warrior Weight Analysis.

[52]USANI, "The Carrying of Loads...," p. 43 and FM 21-18, p. 5-7.

[53]Marshall, pp. 83-84.

[54]Information from DBBL, USAIS.

[55]USANREDC, "Technology Demonstration..." pp. 20-21.

[56]USACDC, "A Study to Conserve...," pp. F-1, F-2.

[57]USAICDA, "A Study to Reduce...," p. 24.

[58]Author's personal experience.

[59]USAIS briefing packet from DCD, DBBL, USAIS.

[60]Hastings and Jenkins, pp. 238-263.

[61]Adkin, pp. 222, 239.

[62]Donnelly, Roth, Baker, pp. 255-256.

[63]FM 7-10, p. 8-8.

[64]Hastings and Jenkins, pp. 269, 274.

[65]Dr. M. Bahrke and LTC J. O'Connor, "Load Carrying Ability Through Physical Fitness Training." Infantry March-April 1990, pp. 33-36.

[66]CALL bulletin #1-88, pp. 13-19.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

> ...it is conspicuous that what the machine has failed to do right up to the present moment is decrease by a single pound the weight the individual has to carry in war.[1]
>
> S. L. A. Marshall

This chapter presents conclusions drawn from the analysis in order to answer the essential question of this study--What are the factors causing or contributing to soldier overload on today's battlefield? Chapter Two reviewed information from three doctrinal sources and over a dozen other references on modern combat operations. Chapter Four analyzed this material to determine the factors that have historically contributed to soldier overload.

This chapter will briefly apply the four criteria outlined in Chapter Three (Mission, Enemy, Technology, and Training) in order to determine the current applicability of the factors on the list. A refined list of twelve current soldier's load factors is shown at Figure 3.

Applicability

Mission

The first criterion is mission. Applying the definition of the mission criteria in Chapter Three, it is apparent that all of the factors are applicable today. Today's dismounted soldier is still expected to close with and destroy the enemy, seizing or holding ground in all conditions of terrain and weather, across the full range of military operations.[2] With the specter of large-scale mechanized warfare somewhat diminished after the demise of the Cold War and the attendant increase in likelihood of Operations Other Than War, it is very likely that U.S. forces will find themselves on foot, fighting highly mobile enemy forces, and in an austere support enviroment. An example of the relationship between mission and the list of factors is seen in the factor "lack of transport." The strategy of a primarily U.S.-based Army capable of force projection will likely serve to exacerbate some of the previously-discussed problems of having sufficient strategic-lift assets to deploy forces and their full complement of supporting vehicles.[3]

Additionally, although much of warfare has changed dramatically since World War Two, dismounted combat operations are still common and characterized by soldiers moving and fighting on foot and sustaining themselves, in

large measure, from their rucksacks. The list of factors was derived from examples of dismounted patrols, raids, attacks, air assaults, airborne, and amphibious landings. These missions are still prominent in today's doctrine.[4]

Enemy

Enemy forces impact significantly on the factors associated with risk. Enemy intentions, unknown to friendly forces, increase the level of uncertainty. As Chapter Four demonstrates, increases in uncertainty often increase the soldier's load.

Having stated this, it does not appear that any of the factors listed are less applicable due to any change in the potential enemy situations our soldier's may face. The demise of the Warsaw Pact has decreased somewhat the chances of large-scale, high-intensity, mechanized warfare. This had little effect on the soldier's load as dismounted combat soldiers were unlikely to be major participants in such a war.

The dismounted infantryman's historical enemies are still plentiful and active in today's world. As FM 100-5 indicates, the Army's potential adversaries span the full range of military operations from drug traffickers, looters, or insurgents in Operations Other Than War to modern, partially mechanized, and numerically superior

armies with access to high technology and weapons of mass destruction in the state of war.[5]

Technology

The third criteria in the evaluation of current applicability is technology. Technology is constantly searching for new ways to gain some advantage over the enemy. However, as evidenced by the analysis in Chapter Four, technology has done little to achieve a soldier's load breakthrough. In fact, as the discussion in Chapter Four demonstrates, technology has served to increase the soldier's load more than it has decreased it.[6]

As far as its interface with the other factors is concerned, technology has not overcome the limits of physical conditioning, nor has it decreased the fire load significantly (although caseless ammunition is promising). Advances in information technology have had some positive influence on the fear of risk, reducing uncertainty, but it is a long way from solving it. Similarly, technology has had little effect on the availability of transportation assets. FM 100-5 states that despite the advances techology has made in the way we train, plan, and fight,

> warfare remains a test of the soldier's will, courage, endurance, and skill. Freezing rain, muddied foxholes, blistering heat, physical exertion, and imminent danger will remain the domain of the soldier.[7]

Training

The final criteria used to evaluate the applicability of the listed factors is training. Training in soldier's load guidance is at the very heart of the prevailing lack of awareness of the problem. According to Army leadership doctrine, good training can also greatly reduce the negative effects of fear and uncertainty on soldiers and units.[8] The U.S. Army's training doctrine explains how leader training is essential to developing subordinates that understand and perform their roles. This training is essential to overcoming problems with the establishment and enforcement of standards and SOPs designed to reduce and manage the soldier's load.[9]

Training, as previously discussed, shows much potential for negating some of the factors discovered. However, as seen from the results of units attending the CTC's, it has had only a minimal positive effect on the soldier's load. One of the most significant points about training is that it bears significant responsibility for our overloaded soldiers. As discussed in Chapter four, this is because one of the major causes of overloaded soldiers is that many leaders do not appreciate the significance of the problem. This is primarily due to a lack of training and a resultant lack of awareness.

In summation, applying the four applicability criteria to the list of factors demonstrates the current

validity of each. The refined list of factors, and the answer to the central question of this thesis is presented at Figure 3.

FACTORS CAUSING SOLDIER OVERLOAD

1. Lack of Appreciation for the Problem
2. Fear and Fatigue
3. Fear of Risk
4. The Fire Load
5. Drag of Orthodoxy
6. Discipline and the Enforcement of Standards
7. Nature of the Soldier
8. The Lack of Transport
9. The Myths of Training
10. The Failure of Technology
11. Terrain and Weather
12. Physical Conditioning

FIGURE 3: REFINED LIST OF FACTORS

Recommendations

The list in Figure 3 and the outline in Appendix A show twelve factors that contribute to and cause soldier overload. This study will conclude with recommendations for managing these factors in an attempt to reduce the soldier's load.

Training

As previously discussed, good training shows high potential for solving the problem of soldier overload. The literature review highlighted several possibilities for this potential solution.

Leader Training

As shown in this study, many of these factors can, in great measure, be controlled through leader education to increase awareness of the problem and recognize recommended solutions. This is the most important first step our leaders can take to reduce the soldier's load. The U.S. Army Infantry School is in position to incorporate primary soldier's load-specific training time in all infantry non-commissioned and commissioned officer development courses. Such training has the potential for increasing awareness of the problem, encouraging the willingness to take action to manage it, and recommending techniques and procedures to use to reduce the soldier's load. Infantry

School studies conducted in 1962 and 1988 concluded with a similar recommendation.[10]

Although the fear-fatigue-fear cycle is a natural human reaction, FM 22-100 asserts that its effects can be mitigated by proper training.[11] Leaders and soldiers should be trained to understand the cycle and its effects, recognize it as it occurs, and more importantly, to consider this cycle when planning for combat operations. This consideration should make allowances for the decreased capabilities soldiers and units can expect when exposed to the fear of actual combat.[12]

Dubik and Fullerton concluded that uncertainty, could be greatly reduced through good training. A critical facet of this is leader training. Leaders must be trained to,

> know that excess weight kills (their) soldiers, to set and enforce specific weight standards, to understand the effects of terrain and weather, to build trust in their unit, and to keep information moving to those who need it.[13]

The reduction of uncertainty is critical to reducing the fear of assuming risk by commanders and their staffs. Leader development programs at unit level could include load plan training for commanders and staffs and should also include the analysis and assumption of risk as essential to the proper determination of what must be carried and what should be left behind.[14]

Finally, leaders need to understand their critical responsibility to develop SOPs for load management procedures within their units; to set specific load limits on a mission-by-mission basis; and to rigorously enforce these limits through pre-combat inspections. Repetitive comments from the combat training centers and the Center for Army Lessons Learned validate this need.[15]

Soldier Training

Soldiers also have to be made aware of the impact of too much weight and potential ways to help. As the load bearers of today and the leaders of tomorrow, they are as much a part of the solution to the problem as victims of its effects. FM 22-100 points out that informed soldiers experience less fear and uncertainty and are better able to contribute to the success of the unit.[16] Thus, soldiers will be more effective if they are exposed to the facets of the load problem. They must understand the fear-fatigue-fear cycle; know the effects of terrain and weather on their ability to carry loads; participate in rigorous, mission-oriented physical conditioning; know and comply with unit SOP's; and be kept informed as much as possible by their chain of command.

Unit Training

Trained leaders and soldiers are the basic building blocks of well-trained units. The problem of soldier

overload is greatly reduced by insuring leaders and soldiers are exposed to it and its solutions. However, as our training doctrine advocates, leader training and individual soldier training are but building blocks to integrated unit collective training.[17]

Since we fight as we train, our unit exercises should continue to fully integrate the stresses of physical exertion and the harsh conditions of foul weather and difficult terrain. Unit transportation assets should routinely store and transport components of the soldier's load, sometimes with reduced means, allowing the development of effective SOP's.[18]

To build trust within and between units, our training exercises must routinely include those with which our units are likely to fight or draw support.[19] Collective training must be fast-paced and demanding to challenge soldiers and units, and yet all must recognize the inherent differences in peacetime capabilities and wartime expectations.[20] Finally, our Combat Training Centers should continue to monitor and assist units with the problems of soldier's load while providing the ultimate peacetime collective training challenge.

Technology

The Army has taken recent steps that should have significant improvement on the focus of technology towards

improving the soldier's load. With the creation of the Dismounted Battlespace Battle Lab and the designation of the dismounted combat soldier as a warfighting system, the Army has an integrated means of tracking all changes and improvements to the soldier's equipment, across the technology and industrial base, and monitoring the impact that each small change has on the land warrior system as a whole.[21]

A near term focus for gains in the area of equipment is found in expanded testing and procurement of lightweight off-the-shelf technologies. This type of procurement, a standard method for the special operations community, allows the Army to field new technologies faster, and often cheaper, by adapting an existing item to military uses. An example of this is the special operations body armor program. Finding the issue Kevlar vest unsuitable for their needs, the special operations community tested several vests designed for law enforcement use, selected, and fielded a lightweight and adaptable military version in far less time than required for the standard Army procurement process. This vest is currently under consideration for adoption Army-wide.[22]

A longer term effort for equipment improvements should focus on the potential benefits to be found in the development of items designed specifically for the dismounted combat soldier and not intended for general

issue to the Army as a whole. Tests by combat developments agencies in the 1960's and 70's support the theory that high technology can provide lighter, purpose-designed items.[23] These items might be disposable or have a shorter service life designed to match their operational lifespan in combat. The potentially higher cost of these items would be offset by their limited scale of issue.[24]

Questions For Further Study

The research indicated some trends that raised questions beyond the scope of this study. These are briefly summarized here to provide questions for future research. First is the apparent key role that leaders have had in the progress of technology. As previously discussed, some technological advances have failed to provide significant gains in weight reduction due to decisions that negated the weight-saving effect of the new technology. The relationship betweer technology and requirements should be studied further in order to determine if greater technological progress, with respect to saving weight, has been impeded.

A second question for further study is the issue of insufficient strategic transportation available to move units and their full complement of tactical transports to the scene of action. Disregarding the larger issues of

aircraft and fast sea-lift ships needed by our forces, the proposed study could examine creative solutions to the problem that are within our present capabilities.

One such idea is the creation of pre-positioned equipment stocks, in several regions of the world, for our light divisions. This equipment, provided by the down-sizing of our Army, would consist primarily of light and medium wheeled tactical transports. In time of crisis, strategic lift and civil reserve air fleet assets would focus on lifting troops, supplies, and outsize cargo. Our relatively more plentiful C-130 assets could deploy to the nearest pre-positioned stockpile and begin lifting additional support vehicles to the crisis scene for use by the deploying units. This would, in effect, be a light, air-transportable version for the pre-positioned equipment system in common use by our heavy forces for years.[25]

Another question for further examination is to determine what is responsible for generally more favorable soldier's load observations toward the end of a unit's JRTC rotation. The observer/controllers typically attribute this to unit improvement as they progress through the rotation from search and attack operations to a deliberate attack. However, another explanation is possible, the search and attack is characterized by uncertainty over enemy strength, locations, and intentions and by decentralized and dispersed small-unit operations;

conditions leading to difficulty in resupply and heavy rucks. In contrast, the later deliberate attack is typically conducted with good intelligence on the enemy and significant unit preparation and rehearsal; conditions favorable for load tailoring. What would the soldier's load be like if another search-and-attack were required after the deliberate attack?[26]

A final potential question for further study is to explore a conclusion reached by Marshall. What impact does the way we conduct training exercises have on the way we fight? As previously mentioned, Marshall specifically notes that often our exercises are very ambitious in nature and demanding in levels of activity. He suggests that this ambition leads to false expectations as to how far units can go or what they can achieve in wartime when the friction and fear of real combat is applied.[27] This interesting question certainly merits further examination.

Summary

The recommendations for individual, leader, and unit soldier's load training coupled with continuing efforts for technological solutions hold some promise for future reductions in the load. Immediate relief, at some level, is available to those leaders who recognize and understand the problem, train their units for the mental and physical stresses of the battlefield, establish

reasonable load limits based on each mission, take risk with leaving certain items behind, enforce the standards they set, and keep their soldiers informed.

Endnotes

[1]Marshall, p. 5.

[2]FM 100-5, pp. 2-1, 2-22.

[3]Ibid., pp. 1-2, 2-2.

[4]FM 7-10, Chs. 4-6 and FM 7-20, chs. 3-6.

[5]FM 100-5, pp. 1-1 - 1-3, 2-0, 10-2.

[6]ADEA briefing packet, 1986 version.

[7]FM 100-5, p. 1-2.

[8]Field Manual 22-100, Military Leadership. (Department of the Army: July 1990) p. 40.

[9]Field Manual 25-100, Training the Force. (Department of the Army: November 1988) pp. 1-5, 1-6.

[10]USAICDA, "A Study to Reduce...," p. 5, and briefing packet from CATD, USAIS.

[11]FM 22-100, p. 40.

[12]Marshall, pp. 40, 41, 47.

[13]Fullerton and Dubik, p. 43.

[14]Briefing packet from CATD, USAIS, 1988.

[15]Information from CALL.

[16]FM 22-100, pp. 40-41.

[17]FM 25-100, pp. 1-3 - 1-9.

[18]Briefing packet from CATD, USAIS, 1988.

[19]Dubik and Fullerton, p. 43.

[20]Marshall, pp. x, xi, 35-36, 51-52.

[21]Information from DBBL, USAIS.

[22]Special Operations Command input to Lightening the Soldier's Load Field Input survey by DBBL, USAIS.

[23]USACDC, "A Study to Conserve...," pp. 1, 3, 15, F-1, F-2.

[24]Ibid.

[25]Concept provided in conversation with Major John M. Nicholson, Fort Leavenworth, Kansas, April 1994.

[26]JRTC data.

[27]Marshall, pp. x, xi, 35-36, 51-52.

APPENDIX A

FACTORS CAUSING SOLDIER OVERLOAD

1. Lack of Appreciation for the Problem

   - lack of awareness of doctrine, management techniques, etc.

   - unwillingness to take action to correct

2. Fear and Fatigue

   - Fear-Fatigue-Fear cycle

   - magnified by uncertainty over threat, mission, support

3. Fear of Risk

   - desire to plan for every contingency

   - fears of the staff: unit failure, soldier discomfort

4. The Fire Load

   - false beliefs: ammo = high morale, out of ammo = defeat

   - lack of reasonable SOPs or lack of enforcement

5. Drag of Orthodoxy

   - tradition and the conservative military mindset

   - tyranny of the SOP: worst-case, total uniformity

6. Discipline and the Enforcement of Standards

   - Failure to establish or enforce/inspect packing lists

7. Nature of the Soldier: "from hoarding to ditching"

8. The Lack of Transport (strategic and tactical)

9. The Myths of Training

   - misconception that training capabilities = wartime

   - problems created by the way we train: structure of exercises, funding, tooth vs. tail focus

   - simulations don't necessarily help

10. The Failure of Technology

   - new capabilities = more weight

   - increasing requirements can kill weight savings

   - "load creep:" excessive durability, isolation of decisions, multi-purpose items, "close enough"

11. Terrain and Weather

   - special equipment needs

   - effects on mobility: heat, gradient, soil conditions

12. Physical Conditioning: the APFT vs. the foot march

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