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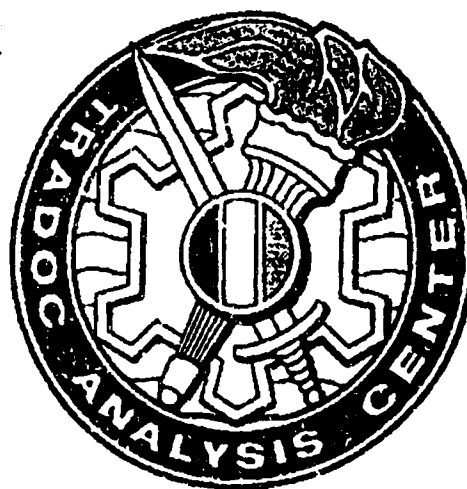


**NON-LINE OF SIGHT -
COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND
LOGISTICS IMPACT ANALYSES (LIA)**

VOLUME I

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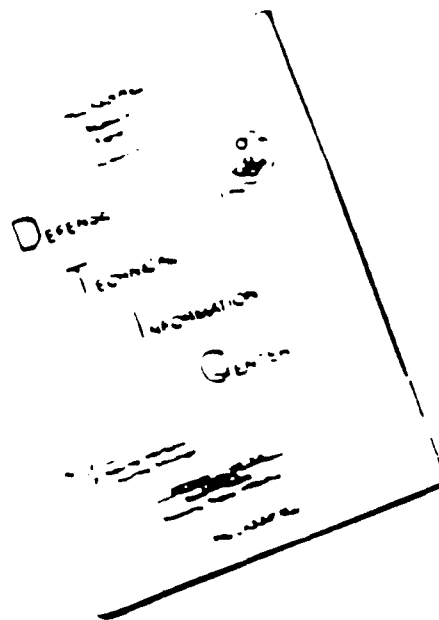
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**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER AND PERSONNEL ANALYSIS (MPA)
AND LOGISTICS IMPACT ANALYSES (LIA)**

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**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER AND PERSONNEL ANALYSIS (MPA)
AND LOGISTICS IMPACT ANALYSES (LIA)**

STUDY SUMMARY

1.1 INTRODUCTION. A continuing need exists to enhance the ability of the Army to engage enemy armor, high-value ground targets, and rotary-wing aircraft. The Non-Line of Sight - Combined Arms (NLOS-CA) Weapon System (WS) is intended to fulfill this requirement.

1.2 PURPOSE. The purpose of these analyses was to identify manpower, personnel and logistics impacts caused by fielding the NLOS-CA WS. These analyses were conducted as integral parts of the NLOS-CA Cost and Operational Effectiveness Analyses (COEA) study. The COEA Study Plan (SP) was prepared by the TRADOC Analysis Center (TRAC) - White Sands Missile Range (WSMR), NM (the study agency). LIA and MPA SPs are included in the COEA as Appendices C and E, respectively. The results of both analyses are included in Volume I of this report. Volume II, the administrative audit trail, is archived at Fort Lee. These analyses were conducted under the supervision of TRAC - Fort Lee (TRAC-LEE), VA. The results of the analyses were provided to TRAC-WSMR for integration into the COEA and for use as source documents for the Milestone (MS) II Decision Review (MDR).

1.3 SCOPE. This study assessed the logistics, manpower, and personnel impacts of the two alternatives for the NLOS-CA WSs. Those impacts were assessed for a Brigade slice or one NLOS-CA company. An assessment of physical requirements and training prerequisites for system operators was also conducted as part of the MPA.

1.4 ALTERNATIVES.

1.4.1 The Base Case is the current force structure. This structure was not included in the study.

1.4.2. There are two alternatives to the Base Case - the NLOS-CA and the Long Range Smart Mortar (LRSM). There is no predecessor system for either alternative.

1.4.2.1 Alternative 1. The NLOS-CA is Alternative 1. This system consists of a gunner's station and fiber-optic guided missile (FOG-M) launcher sub-system mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV) in both heavy and light configurations. The missiles will be stored, transported and loaded in a unitized launch-storage container with a six-round capacity. Cameras and sensors in the FOG-M enable the gunner to identify and engage targets at a range of several kilometers while remaining within the protection of cover. The NLOS-CA will be a Brigade asset which will receive targeting information from the Brigade Tactical Operations Center (TOC). The WS will be fielded as a company assigned to both light and heavy brigades.

1.4.2.2 Alternative 2. The LRSM is Alternative 2. This is a notional system. For this study, it is defined as the 120mm, Battalion Mortar System (BMS) now in the field, but armed with precision-guided mortar munitions. Employment and doctrine for the LRSM have not been formally defined. For this study, LRSM will replace NLOS-CA systems one-for-one in NLOS-CA companies. NLOS-CA Operational Mode Summary/Mission Profile (OMS/MP) and operational concepts will apply to the LRSM. This alternative was studied in two versions. The light version will be transported in a HMMWV and unloaded manually for firing. The heavy version will be mounted in the M1064, M113A derivative, tracked carrier designed for the 120mm BMS.

1.5 TECHNICAL APPROACH

1.5.1 Logistics Impact Analysis (LIA) Essential Elements of Analysis (EEAs):

1.5.1.1 EEA 1. What are the supply differences between the alternatives?

1.5.1.2 EEA 2. What are the maintenance differences between the alternatives?

1.5.1.3 EEA 3. What are the transportation differences between the alternatives?

1.5.1.4 EEA 4. What are the Combat Service Support (CSS) Force Structure differences between the alternatives?

1.5.1.5 EEA 5. What are the differences in Reliability, Availability and Maintainability (RAM) between the alternatives?

1.5.1.6 EEA 6. What are the differences in transportability and deployability between the alternatives?

1.5.1.7 EEA 7. What are the Manpower and Personnel (MP) differences between the alternatives?

1.5.2 Manpower/Personnel Analysis EEAs.

1.5.2.1 EEA 1. What are the MP Force Structure requirements for the alternatives?

1.5.2.2 EEA 2. What are the personnel requirements by Military Occupational Specialty (MOS) and grade for the alternatives?

Assessment of these EEAs was based on analysis of 27 Measures of Performance (MOP) and Measures of Effectiveness (MOE). The analyst ranked the alternatives across multiple levels of hierarchical criteria. The methodology is discussed in detail in Appendix G of this report. The alternatives were compared for each MOP and MOE. MOPs and MOEs were compared for their relative importance to each sub-analysis area. In turn, the sub-analysis areas were compared for their influence on the

logistics impact of each EEA. Finally, the relative influence of each EEA on the logistics impact was established.

1.5.3 **RESULTS.** The results of this analysis are summarized in Table 1.

TABLE 1

LOGISTICS IMPACT

Alternative 1 (NLOS-CA) versus Alternative 2 (LRSM)
(X = Greater Logistics Impact, 0 = Equal Logistics Impact)

		NLOS-CA	LRSM
GOAL	LOGISTICS IMPACT	0	0
EEA1	SUPPLY		X
EEA2	MAINTENANCE	X	
EEA3	TRANSPORTATION	0	0
EEA4	CSS FORCE STRUCTURE	0	0
EEA5	RAM		X
EEA6	DEPLOYABILITY	0	0
EEA7	MANPOWER/PERSONNEL	0	X

1.5.3.1 The table above portrays absolute differences in relative logistics impact. Analysis described in the report discusses the magnitude and quality of these differences.

1.5.3.2 Logistics Impact - Alternative 1 versus Alternative 2.

A. The overall Logistics Impact, i.e., logistics burden, of Alternative 2 is marginally greater than that of Alternative 1.

B. The impact is greatest in the Supply EEA. The LRSM firing rate is at least twice that of the NLOS-CA. This drives a higher ammunition supply requirement. The heavy version of the LRSM is tracked, thus requiring more fuel. This is further increased by the higher usage rates applied to the heavy scenario.

C. The NLOS-CA requires more maintenance support. Under a two-level maintenance concept a Direct Support (DS) contact team replaces any unit maintenance. This significantly increases workload at that level and may represent some risk in the maintenance supportability area.

D. The NLOS-CA is electronics-intensive and will require Test, Measurement, and Diagnostic Equipment (TMDE) from division assets that already support other systems. The LRSM has very little requirement for WS maintenance in the field.

E. The LRSM is fully interoperable within the present four-level maintenance system.

1.5.3.3 Measure of Performance (MOP)/Measure of Effectiveness (MOE) Analysis. Table 2 summarizes the significant differences in logistics impact at the MOP/MOE level of analysis.

TABLE 2

MOP/MOE COMPARISON SUMMARY

NLOS - CA	COMPARISON	LRSB
Fuel Gal Per Day	LRSB Logistics Burden Greater Than NLOS-CA	Fuel Gal Per Day
Fuel Tons Per Day	LRSB Logistics Burden Greater Than NLOS-CA	Fuel Tons Per Day
Ammo Tons Per Day	No Significant Difference	Ammo Tons Per Day
Ammo CUFT Per Day	No Significant Difference	Ammo CUFT Per Day
Round Dimensions	No Significant Difference	Round Dimensions
Pallet Size	No Significant Difference	Pallet Size
Stowed Rounds	No Significant Difference	Stowed Rounds
Material Handling Equipment	NLOS-CA Logistics Burden Greater than LRSB	Material Handling Equipment
Storage	No Significant Difference	Storage
TMDE	NLOS-CA Logistics Burden Greater than LRSB	TMDE
Maintenance Concept	NLOS-CA Logistics Burden Greater than LRSB	Maintenance Concept
MTBOMF	No Significant Difference	MTBOMF
MTBUMA	No Significant Difference	MTBUMA
MTTR	No Significant Difference	MTTR
MR	LRSB Logistics Burden Greater Than NLOS-CA	MR
DPAMMH	No Significant Difference	DPAMMH
Ao	No Significant Difference	Ao
Fuel Trucks Per Day	No Significant Difference	Fuel Trucks Per Day
Ammo Trucks Per Day	No Significant Difference	Ammo Trucks Per Day
Deployability	No Significant Difference	Deployability
Recoverability	No Significant Difference	Recoverability
EOD	No Significant Difference	EOD
Standardization	No Significant Difference	Standardization
Interoperability	No Significant Difference	Interoperability
Manpower	No Significant Difference	Manpower
Personnel	No Significant Difference	Personnel

Although overall logistics impact is almost equal, there are significant differences in impact in fuel consumption and Maintenance Ratio (MR), material handling equipment (MHE), TMDE and maintenance concept. These differences are as follows:

A. Fuel Consumption and Maintenance Ratio (MR). The M1064, tracked carrier used in the heavy configuration of LRSM accounts for both greater fuel consumption and MR for the LRSM versus the NLOS-CA.

B. MHE. The six round missile storage/launch containers require on-board MHE for loading and downloading NLOS-CA missiles. The dimensions and weight of the containers will also require the availability of MHE throughout the ammunition pipeline. These requirements represent a significant logistics impact for the NLOS-CA versus the LRSM which requires no special or additional MHE for ammunition handling.

C. Maintenance Concept. The stated maintenance concept for the NLOS-CA does not provide organic assets for unit level maintenance on the NLOS-CA gunner's station. Unit level maintenance (Line Replaceable Unit (LRU) diagnosis, remove and replace) will be performed by the Forward Maintenance Teams from the DS Organization. This will increase the workload of DS maintainers who are already supporting other WSs throughout the Brigade area of operations.

D. TMDE. The electronics-based NLOS-CA gunner's station requires TMDE support for LRU diagnosis and repair. Although, the estimated TMDE workload is not significant, it represents an additive requirement for another Test Program Set (TPS) and an additional burden on a critical and heavily used maintenance asset.

E. Manpower. Estimated manpower requirements for both NLOS-CA and LRSM are similar. The relative logistics impact is minimal, however, because no "bill-payer" system has been identified, all manpower requirements represent a net addition to current level.

1.5.3.4 Operator Training Pre-Requisite Analysis. A high level assessment was conducted to assess whether or not MOS 11H (Heavy Anti-Armor Weapons Infantryman) possesses the necessary physical attributes and prerequisite skills and knowledge to operate the NLOS-CA gunner's station. The assessment was limited to the NLOS-CA gunner's station operation and was based on data extracted from the Target Audience Description (TAD) contained in the NLOS-CA System MANPRINT Management Plan (SMMP). MOS 96H (Aerial Intelligence Specialist) was used as the baseline MOS for comparability analysis. Armed Forces Qualification Test (AFQT) and Armed Services Vocational Aptitude Battery (ASVAB) scores, education level, and Physical capacity, Upper extremities, Lower extremities, Hearing, Eyes, Psychiatric (PULHES) classification were used as analysis criteria. The results of the analysis indicate that there is some risk in assuming that the 11H MOS is an appropriate MOS for the NLOS-CA gunner position. This risk is associated primarily with requirements for color vision and ASVAB requirements.

1.6 CONCLUSIONS. The overall Logistics Impact of Alternative 2 is marginally greater than that of Alternative 1. Given that the NLOS-CA and the LRSM in the light configuration both use the heavy HMMWV, and, if firing rates and usage rates are very similar, then similar logistics impacts can be anticipated. If a more detailed MP and operational concept for the LRSM becomes available, then the logistics impact should be reassessed.

NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA) MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)

CHAPTER I

1.0 INTRODUCTION. The United States Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC), Fort Lee, Virginia, contracted with Advanced Engineering and Planning Corporation (AEPCO) and Dynamics Research Corporation (DRC) to perform a Manpower, Personnel (MP) and Logistics Impact Analyses (LIA) study on the Non-Line of Sight - Combined Arms (NLOS-CA) Weapon System (WS). Both contractors worked closely with the NLOS-CA Project Manager's Office (PMO), U.S. Army Missile Command (USAMICOM), Redstone Arsenal, Alabama, and received excellent support from the U.S. Army Ordnance Missile and Munitions Center and School (USAOMMCS), the U.S. Army Infantry School (USAIS), the U.S. Army Ordnance Center and School (USOC&S), the U.S. Army Transportation School (USATSCH), the U.S. Army Combined Arms Support Command (USACASCOM), and the Program Manager (PM) Mortars at the Army Research, Development and Engineering Center, Picatinny Arsenal. Analysis results and methodology are summarized in this report. Detailed analyses are documented in the appendices of this volume. Volume II, The Administrative Section, provides a chronology of the development of the LIA Analysis Plan and subsequent development of this report. Included in Volume II are data sheets and certifications provided by data sources.

1.1 OVERVIEW. This LIA and MP analyses was conducted in support of the anticipated March 1994 NLOS-CA Army System Acquisition Review Council (ASARC) Milestone (MS) II Decision Review (MDR). The MP analysis was conducted in conjunction with the LIA in support of the COEA and is documented in this report. The NLOS-CA MS II COEA Study Plan (SP) was certified on 10 June 1993 by TRAC Headquarters, Fort Leavenworth, Kansas. The COEA SP provides guidance on the Essential Elements of Analyses (EEA) needed to conduct this analysis. Appendix C and Appendix E to the COEA SP describe the requirements for the LIA and MP analysis requirements, respectively.

1.2 NLOS-CA SYSTEM DESCRIPTION. The NLOS-CA is a highly mobile, flexible addition to the U.S. Army's war-fighting capabilities designed to engage and defeat a wide variety of targets including armored combat vehicles, other high value ground targets, and hovering or moving rotary wing aircraft which may be masked from the line of sight. The WS shall operate in day/night and adverse weather (DNAW). NLOS-CA targets will be preplanned or engaged as targets of opportunity. The NLOS-CA Company will be an integral part of the maneuver brigade. NLOS-CA platoons may be attached to one maneuver battalion/task force or may be employed in

support of the brigade battle. Target acquisition and identification information for NLOS-CA will be provided by the Brigade Tactical Operations Center (TOC) through organic communications to the NLOS-CA Platoon for assignment to firing units. A two man crew consisting of gunner and driver will operate the system. Two variants of NLOS-CA are ultimately expected to be procured: a wheeled version mounted on the M1097 Heavy High Mobility Multipurpose Wheeled Vehicle (HMMWV), or HHV; and a tracked version which will utilize the Bradley Fighting Vehicle chassis as a prime mover. This analysis is limited to this HHV-mounted version. The NLOS-CA consists of a vehicle mounted fire unit (FU) armed with fiber optic guided missiles; a launcher; and a gunner's station for mission planning, fire control, and embedded training functions; Single Channel Ground and Airborne Radio System (SINCGARS) radios; and materiel handling equipment (MHE) for reloading missile assemblies (see Figure 1-1 System Sketch). The NLOS-CA's subsystem elements consist of the following:

1.2.1 Missile. The NLOS-CA missile (see Figure 1-2 Missile Sketch) will have the unique ability to transmit, via a fiber optic cable, real time seeker video images to the gunner's console (GC). Simultaneously, gunner initiated and system generated guidance commands can be transmitted up the fiber optic cable to the missile for implementation. Missiles will be stored, transported and loaded onto the launcher while encased in a launch/storage container (L/SC) with a six round capacity. The combination of a missile and the L/SC is defined as a missile assembly.

1.2.2 Prime Mover. The M1097 HHV will be the prime mover for the NLOS-CA FU which will be manned by a crew of two. The physical characteristics of the HHV will define the envelope for allowable weight and space of the NLOS-CA WS equipment including on vehicle equipment (OVE), the crew and their equipment.

1.2.3 Gunner's Station. The gunner's station is defined as the aggregation of all equipment and interfaces required to carry out the gunner's functions of land navigation, emplacement, mission planning, receipt and processing of target cues, missile launch and flight, target area search, lock-on, terminal homing, aimpoint readjustment, damage assessment, battlefield surveillance, and embedded training. The primary WS display and man/machine interface to components of the gunner's station is the GC.

1.2.4 Launcher. The launcher supports and contains the missile assemblies during the travel, reload and launch sequences. The launcher system shall be used to orient the missile assemblies prior to launch. Design of the launcher facilitates ease of missile assembly reload.

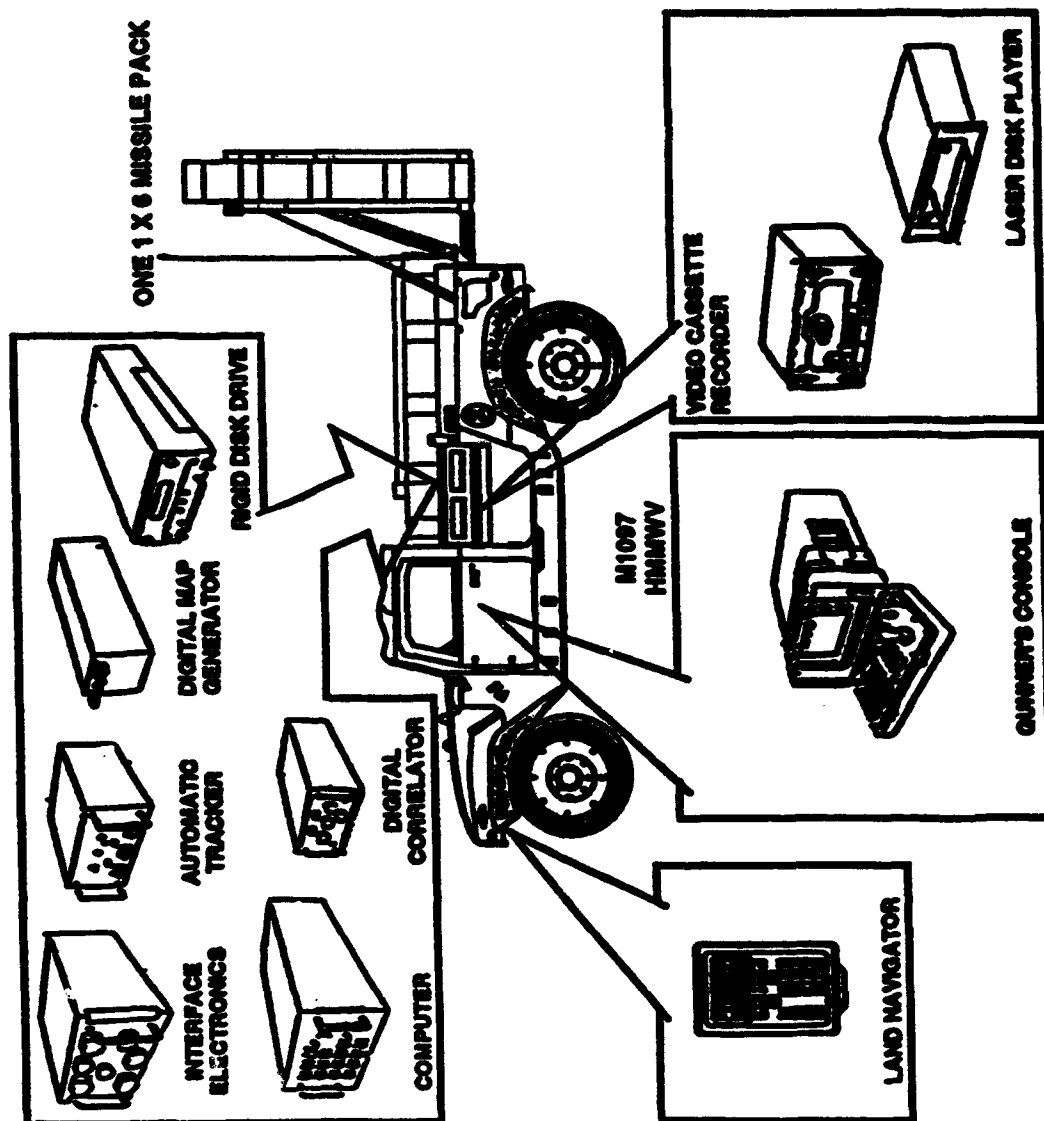
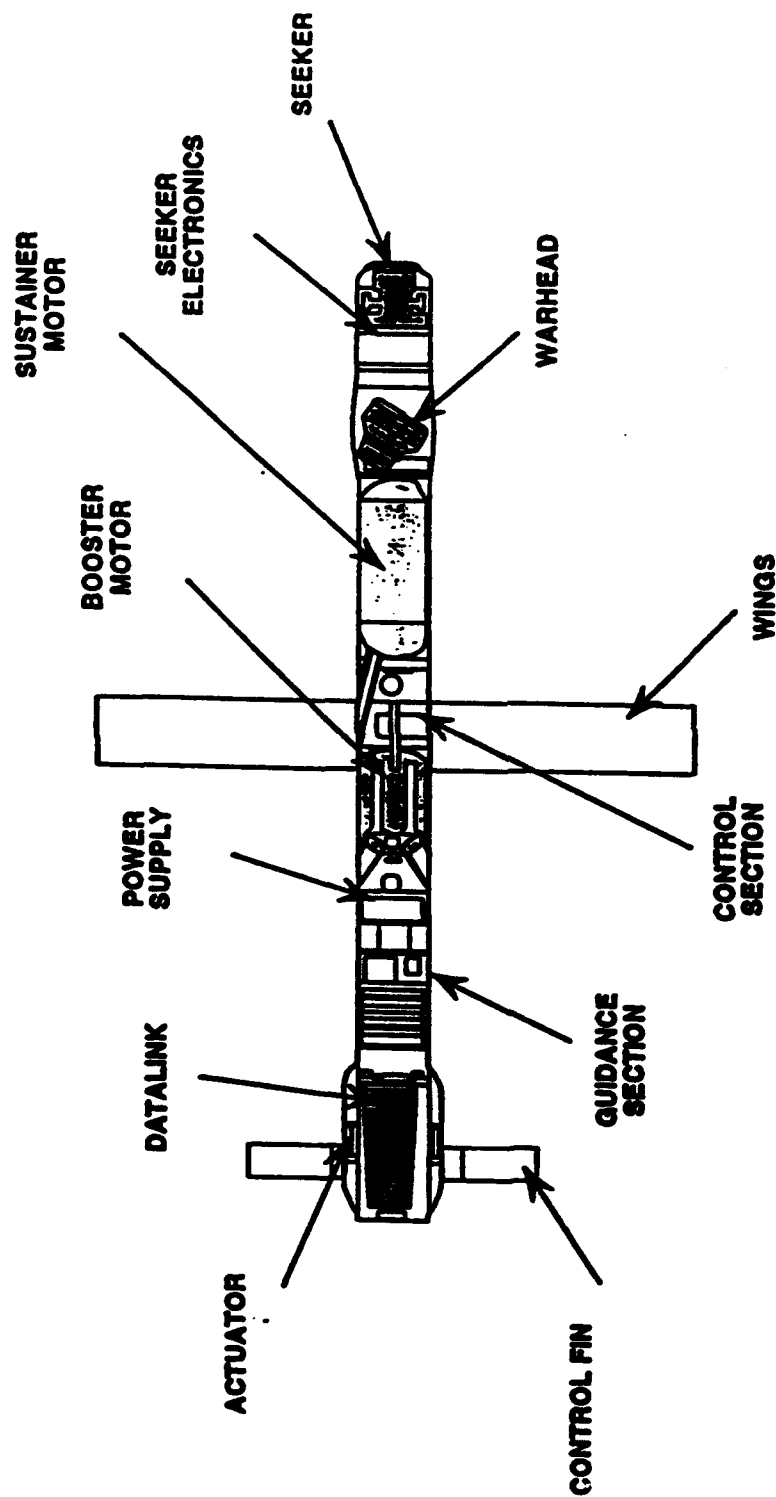


FIGURE 1-1 NLOS-CA System Description
Source: ILSP for NLOS-CA System, dated July 1993



• MISSILE DRAWING NOT TO SCALE

FIGURE 1-2 FOG-M System Description
Source: ILSP for NLOS-CA System, dated July 1993

1.2.5 Logistics. The NLOS-CA will be supportable by standard Army logistics systems in place at First Unit Equipped (FUE) and will use existing TOE tools, Test Measurement and Diagnostic Equipment (TMDE), and support equipment and personnel. The existing four level maintenance concept will be applied to GFE. The NLOS-CA FU will employ a three level maintenance concept: Unit, Direct Support (DS) and Depot. No organic maintenance capability will be available within the NLOS-CA company to provide unit level maintenance support. DS maintenance personnel will perform unit level maintenance workload for the system.

1.3 NLOS-CA ACQUISITION SCHEDULE. The NLOS-CA program was initiated in the late 1980's by the U.S. Army Missile Research and Development Center at Redstone Arsenal, Alabama. A full scale development (FSD) contract was awarded in 1988, but was terminated prior to completion of the Critical Design Review (CDR). Following termination of the FSD contract and review of the Program, alternate contracting approaches were developed and an accelerated acquisition strategy which maximizes the effectiveness of the government's previous development work was selected. That strategy, as of the date of preparation of this report is summarized as follows (see Figure 1-3 NLOS-CA Program Schedule). Due to uncertainties in the current budget process, changes in this schedule are under consideration.

- Initiation of Engineering and Manufacturing Development (EMD) for NLOS-CA is scheduled for the third quarter of Fiscal Year (FY) 94.
- A contract will be awarded for a 42-month effort to design, fabricate, conduct flight tests and manrate the system.
- A 24-month Test and Engineering Support option is available to complete test technical performance testing and further prove the readiness of the system for Low Rate Initial Production (LRIP).

1.4 SCOPE AND STATEMENT OF WORK. The scope of the MP and LIA are based on the NLOS-CA COEA SP as amended by guidance from the COEA study team and is delineated as follows:

1.4.1 Issues Addressed in this Study. Logistics and MP impacts were analyzed for a brigade level organization. Light and heavy brigades were addressed. A high level assessment of skills and knowledge prerequisites for institutional training of system operators and maintainers was completed as part of this study.

1.4.2 Alternatives Addressed in this Study. Two alternatives were assessed: (1) The NLOS-CA objective system; and (2) a Long Range Smart Mortar (LRSM) system. Both alternatives are described in detail in paragraph 1.5.

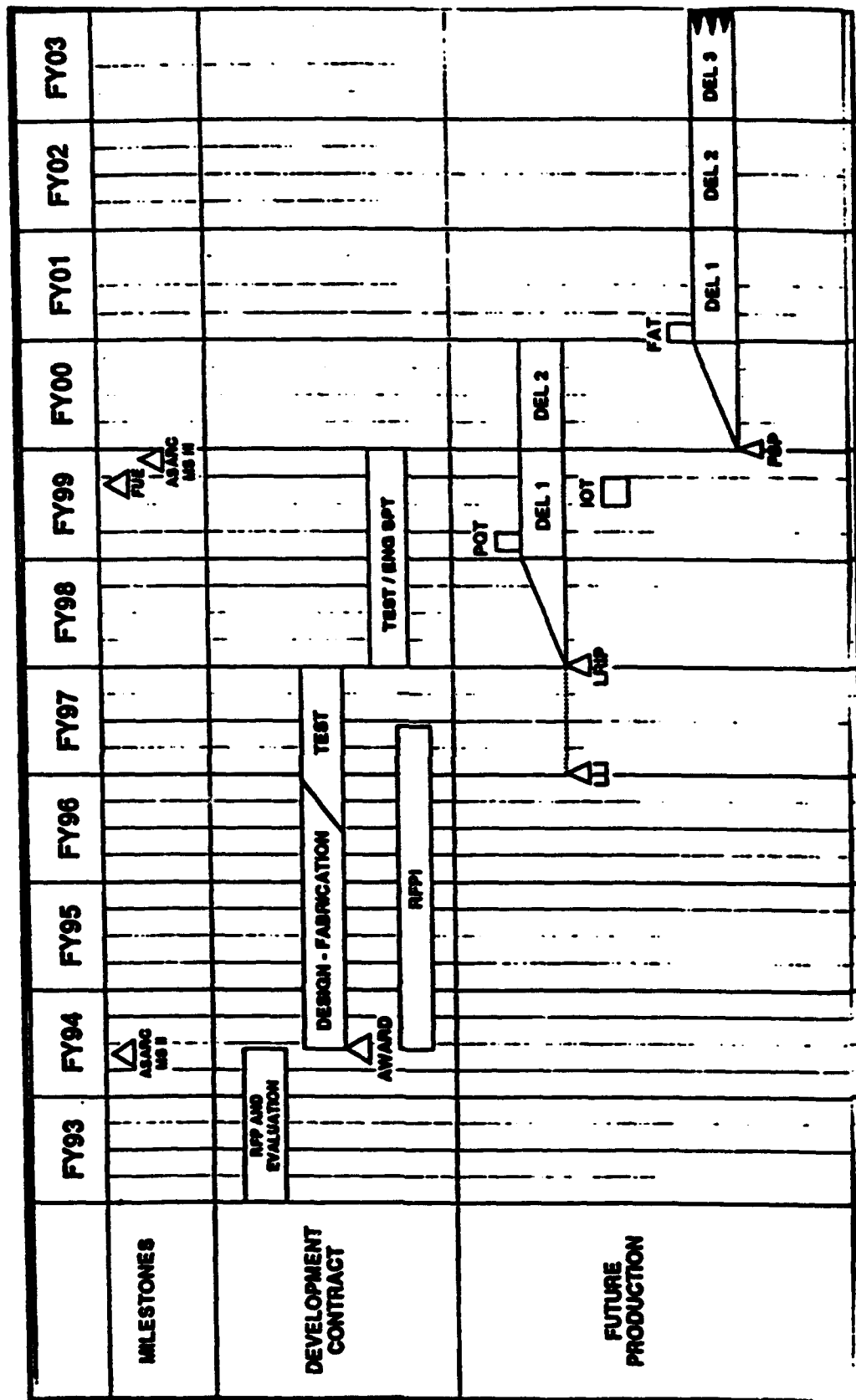


FIGURE 1-3 NLOS-CA Program Schedule
Source: ILSP NLOS-CA System, dated July 1993

1.4.3 **Issues Not Addressed in this Study.** Cost and training impacts were not assessed as part of the MP and LIA studies.

1.5. **COEA STUDY PLAN ALTERNATIVES.** In accordance with the NLOS-CA COEA SP and guidance provided by the COEA study team, two alternative configurations (see Table 1-1) were assessed to determine their impact on MP and logistics support structures in place.

1.5.1 **Base Case.** There is no formal base case alternative for this study. NLOS-CA and the LRSM will be fielded as additions to the current force structure and will not replace any existing systems.

1.5.2 **Alternative Number 1.** The NLOS-CA alternative consists of the 1999 programmed force structure and equipment augmented by NLOS-CA. The system configuration and force structure is described as follows:

1.5.2.1 **System Configuration.** The current NLOS-CA design is based on the Fiber-Optic Guided Missile (FOG-M). Both heavy and light versions will be mounted on heavy HMMWVs. The NLOS-CA will be fielded as a separate company within the Brigade.

1.5.2.2 **Force Structure.** The study addresses logistics impacts on a heavy brigade with two armor battalions and two mechanized infantry battalions; and a light infantry brigade with three light infantry battalions. Total army impact was not addressed by the LIA. NLOS-CA force structure was based on TOE 07348T100, NLOS-CA Company (HVY); and TOE 07348T200 NLOS-CA Company (INF). Both organizations are assigned 12 NLOS-CA systems.

1.5.3 **Alternative Number 2.** Alternative Number 2 consists of the 1999 programmed force structure and equipment augmented by the LRSM.

1.5.3.1 **System Configuration.** The LRSM WS consists of a 120 millimeter (mm) mortar armed with "smart" munitions. The Heavy Version will be identical to the 120mm heavy mortar mounted in the M1064 model of the M113A chassis. The 120mm mortar is now fielded as the Battalion Mortar System (BMS). The light version will be mounted on a heavy HMMWV chassis for transport. The crew will dismount, emplace, displace and restow the weapon by hand. Munitions will be the Advanced Precision Guided Mortar Munitions (APGMM) with millimeter wave seeker guidance. For this study, the LRSM will be substituted for the NLOS-CA in the NLOS-CA company.

1.5.3.2 **Force Structure.** The LRSM will replace NLOS-CA, one-for-one in this study. NLOS-CA TOEs were used. The HMMWV transported, light version of the LRSM will be exchanged directly into the light NLOS-CA TOE. The Heavy Version, mounted in the M1064 will be inserted in the Heavy, track mounted, NLOS-CA TOE. Twelve (12) LRSMs are assigned to each NLOS/LRSM company.

	BASE CASE	ALT 1	ALT 2
HEAVY BDE SRC 87042L231	CURRENT FORCE	HMMWV-MTD FOG-M NLOS-CA COMPANY - TOE 07348T200	M1064 MTD 120mm LRSM NLOS-CA COMPANY - TOE 07348T100
LIGHT BDE SRC 77042L000	CURRENT FORCE	HMMWV-MTD FOG-M NLOS-CA COMPANY - TOE 07348T200	HMMWV* 120mm LRSM NLOS-CA COMPANY - TOE 07348T200

* HMMWV mounted for transportation only.

TABLE 1-1 NLOS-CA LIA Alternatives

1.6 TECHNICAL APPROACH, METHODOLOGY AND TOOLS. A "tailored" analytical approach, using only those analytical steps that were necessary to determine accurate MP and logistics impacts was employed.

1.6.1 Technical Approach. The technical approach used to determine NLOS-CA MP and logistics impacts consisted of the following steps (see Figure 1-4):

- Review Documentation. MP and logistics data and documentation was reviewed. Documents included specifications, acquisition support documents and supportability studies for both systems, GFE and surrogates. (see Appendix B in Volume I for a complete list of publications and reference materials researched).
- Determine data requirements;
- Collect Data. Selected subject matter experts (SMEs) and targeted data sources were interviewed and data requests were submitted. AEPCO/DRC analysts also attended several COEA SP meetings (see Volume II). Meetings were used to collect data, discuss various aspects of the NLOS-CA program, and obtain detailed guidance for MP and LIA execution.
- Conduct Analysis. MP and LIA impacts for the two alternatives were determined.
- Document Results.

1.6.2 Methodology. The methodology that was used in the conduct of this LIA was as follows:

- Essential Element of Analysis (EEA) #4 in the COEA SP addresses the training, logistics, manpower and personnel impacts of fielding the NLOS-CA. Training assessments are being conducted in a separate study.
- This general requirement was translated into six EEAs for the LIA through a review of Integrated Logistics Support (ILS) elements relevant to the respective systems.
- Measures of Performance (MOP) and Measures of Effectiveness (MOE) were identified for each EEA and each sub-analysis.
- Data requirements were identified and requests prepared.
- PM data sets were the primary sources of study data. PMO NLOS-CA coordinated data for that system and PM Mortar coordinated data requirements for the LRSM.

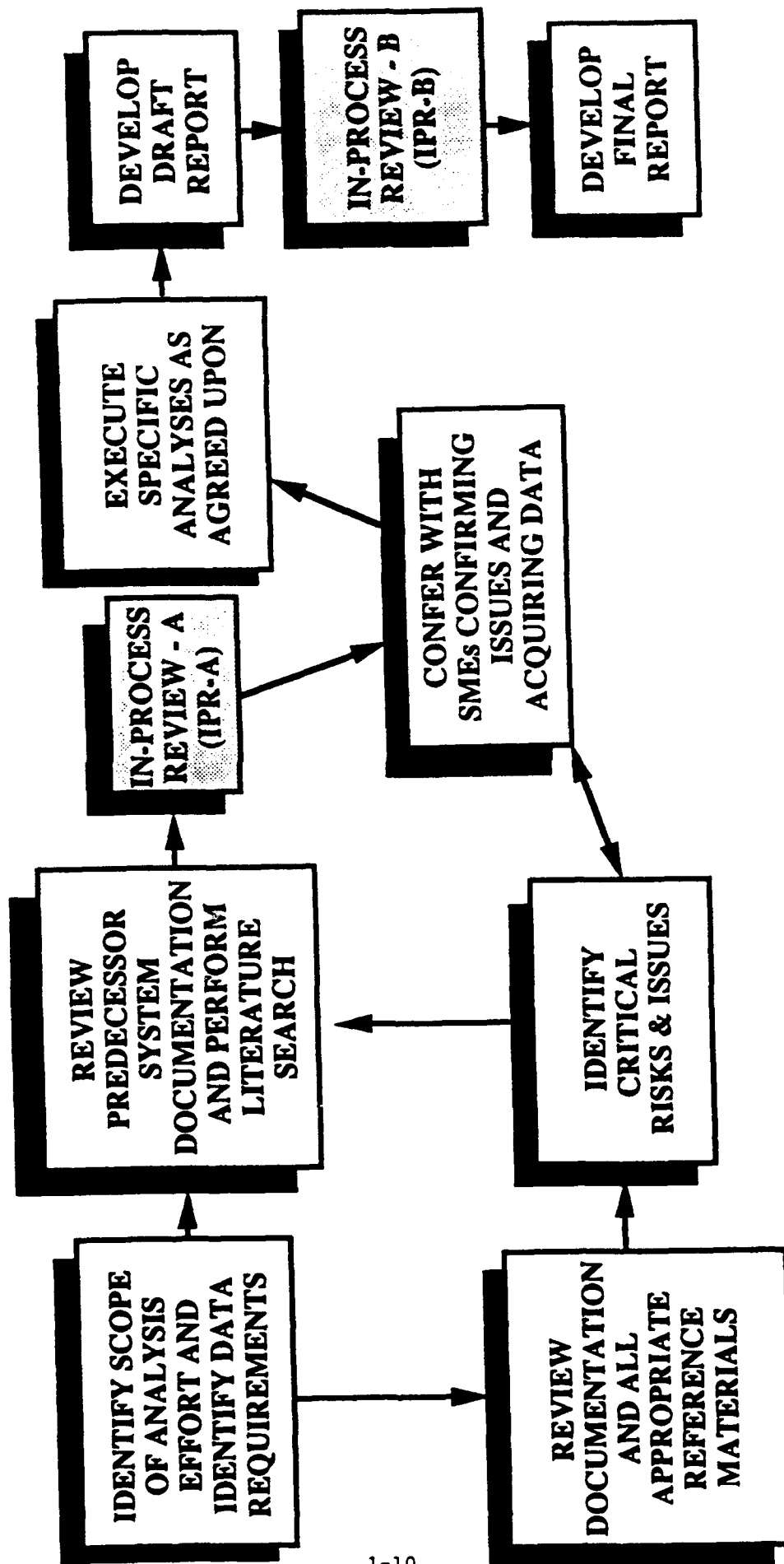


FIGURE 1-4 NLOS-CA LIA/MPA Technical Approach

- The results of sub-analyses have been consolidated and an overall assessment of logistics supportability has been conducted using EEA criteria.
- The analysis and results documented in this LIA report will be incorporated in the NLOS-CA COEA.

1.7 ASSUMPTIONS AND CONSTRAINTS. Assumptions and constraints documented in the COEA study plan apply to the LIA and MP analysis.

1.7.1 Study Rules

A. The base case for this study is the current force. Logistics requirements for the base case are considered to be zero. Both Study Alternatives are net additions to the force structure.

B. Analysis is based on the worst case scenario (heaviest logistics burden). This scenario is the 96 hour combat scenario defined in the NLOS-CA Operational Mode Summary/Mission Profile (OMS/MP).

C. The NLOS-CA OMS/MP applies to the LRSM.

D. Issues associated with employment and command and control (C²) of the LRSM are not addressed within the LIA.

1.7.2 Constraints

A. The LRSM has not been formally defined. Analysis is based on guidance provided by USAIS, PM Mortar and TRAC through the COEA study team. This guidance is documented throughout the study.

B. Because LRSM is a notional system, mature data was unavailable in many cases. The best available data was used with the approval of responsible agencies.

1.8 ESSENTIAL ELEMENTS OF ANALYSIS. TRAC-LEE at Fort Lee, Virginia directed that the analyses be focused on the following:

1.8.1 Logistics Impact Analysis EEAs.

1.8.1.1 LIA EEA 1. What are the supply differences between the alternatives.

1.8.1.2 LIA EEA 2. What are the maintenance differences between the alternatives.

1.8.1.3 LIA EEA 3. What are the transportation differences between the alternatives.

1.8.1.4 LIA EEA 4. What are the Combat Service Support (CSS) Force Structure differences between the alternatives.

1.8.1.5 LIA EEA 5. What are the differences in Reliability, Availability and Maintainability (RAM) between the alternatives.

1.8.1.6 LIA EEA 6. What are the differences in transportability and deployability between the alternatives.

1.8.2 Manpower and Personnel EEAs.

1.8.2.1 MP EEA 1. Determine MP Force Structure requirements for the NLOS-CA COEA in support of the MDR II.

1.8.2.2 MP EEA 2. Determine the personnel requirements by Military Occupational Specialty (MOS) and grade for the NLOS-CA and the LRSM alternatives.

1.9 MEASURES OF PERFORMANCE (MOP)/MEASURES OF EFFECTIVENESS (MOE). Twenty-seven (27) MOPs and MOEs were used to assess logistics impacts of NLOS alternatives. They are listed below by sub-analysis.

1.9.1 Supply

Class III and V Supplies. Gross requirements for fuel (gallons), and ammunition (short tons) per brigade per day.

- Class III Gallons
- Class III Tons
- Class V Cubic Feet
- Class V Tons

1.9.2 Packaging, Handling, and Storage (PHS). Resources and procedures used to ensure that PHS ammunition needs were met included the following:

- Round Size
- Pallet Size
- Brigade Stowed Rounds
- MHE Requirements
- Storage Requirements

1.9.3 Maintenance. Resources, procedures and equipment required for system maintenance of the alternatives included the following:

- TMDE Type and Quantity
- BIT/BITE
- Maintenance Concept

1.9.4 Reliability, Availability and Maintainability (RAM). RAM sub-analyses have included the following:

- Direct Productive Annual Maintenance Man Hours (DPAMMH)
- Mean Time Between Operational Mission Failure (MTBOMF)
- Mean Time Between Unit Maintenance Actions (MTBUMA)
- Mean Time to Repair (MTTR)
- Maintenance Ratio (MR)
- Operational Availability (A_o)

1.9.5 Transportation. Trucks required to move supply requirements calculated in the supply sub-analysis included the following:

- Class III trucks per day
- Class V trucks per day

1.9.6 Transportability/Deployability. Assessment of the limitations by transportation mode and deployability requirements of the alternatives included the following:

- Shipping Requirements
- Transportation Mode Constraints
- Aircraft Sorties
- Days to Prepare

1.9.7 Recoverability. Resources, procedures and equipment required to recover unserviceable weapons systems from field locations.

- Recoverability.

1.9.8 Explosive Ordnance Disposal (EOD) Requirements. Resources, procedures and equipment required to support EOD requirements of the WS.

- EOD

1.9.9 Standardization and Interoperability. Extent of hardware commonality with exiting inventories and the ability of the system to provide and accept services from other systems and forces.

- Standardization and Interoperability.

1.10 RELATIONSHIP OF EEA, SUB-ANALYSES, MOP AND MOE. The relationship between EEA, sub-analyses and MOP/MOE is the basis for the application of the AHP. The relationship between MOP/MOE and sub-analyses is described in paragraph 1.9 above. The relationships between sub-analyses and EEA is displayed in Figure 1-5. Although EOD, Recoverability, and Standardization and Interoperability are not assigned EEAs, they are nonetheless critical to logistics supportability, and have been incorporated in this study as sub-analyses.

Sub-analysis

EEA	Supply	PHS	Maintenance	RAM	Transportation	Transportability/ Deployability	Recoverability	EOD	Standardization & Interoperability	MANPOWER	PERSONNEL
Supply Differences	X										
Maintenance Differences			X						X	X	
Transportation Differences		X			X						
CSS Force Structure Differences		X	X	X	X		X	X	X	X	X
Reliability Differences				X						X	
Operational Availability Differences				X							
Maintainability Differences				X						X	
Transportability & Deployability Differences						X					
Manpower/Personnel										X	X

FIGURE 1-5 Sub-Analysis to EEA Relationships

NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA) MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)

CHAPTER 2

2.0 LOGISTICS IMPACT ANALYSES. The Logistics Impact Analysis (LIA) determines and assesses the logistics impact of fielding the NLOS-CA weapon system (WS). It provides independent results and inputs to the COEA and MILESTONE II decision process. It also provides input to cost and other COEA sub-analyses.

2.1 GENERAL. The final version of the LIA Annex to the COEA will be provided by TRAC-LEE.

2.1.1 Objective and Scope. The objective of this LIA is to determine the logistics impact on the Combat Service Support (CSS) system of fielding either alternative of the NLOS-CA WS. This study analyzed the impact of NLOS-CA at the maneuver brigade level for two alternative configurations.

2.1.2 LIA Assumptions and Constraints

2.1.2.1 Assumptions

- All LIA analyses are consistent with the requirements of the COEA.
- The Base Case for this study is the current force structure. NLOS-CA and LRSM will be net additions to Brigade resources.
- Impacts were assessed for the worst case (heaviest logistics burden) scenario. The 96 hour combat scenario found in the NLOS-CA, OMS-MP describes this scenario.
- The study addressed objective configurations of alternatives. Interim configurations or fielding concepts will not be addressed.

2.1.2.2 Constraints

- The LRSM concept has not been formally defined. Analysis has been based on guidance provided by the USAIS, PM Mortar and TRAC through the COEA study team.
- Because LRSM is a notional system, mature data was not available in many cases. The best available data was used with approval of the cognizant agencies.

- The stringent time frame allotted for completion of this study limited the analysts ability to collect and edit data. Where certified data was not available, standard references were used.

2.2 ANALYSIS AND RESULTS. The following paragraphs summarize the analysis conducted to determine the logistics impact of Alternatives 1 and 2 as measured by Measure of Performance (MOP) or Measure of Effectiveness (MOE). These analyses are organized by sub-analysis. In some cases, more detailed analysis was conducted to develop underlying assumptions to the analyses summarized in this section. These detailed analyses are presented in the Appendices to this report.

2.2.1 Supply. The purpose of this sub-analysis was to determine the impact on supportability of gross quantities of fuel and ammunition required by the NLOS-CA and LRSM WSS. Short tons, cubic feet and gallons per day per NLOS-CA company were calculated for both alternatives. These values form the basis for determining truckload and vehicle support requirements. They also represent an indirect logistics impact on the supply system independent of transportation requirements. Supplies require handling and storage throughout the pipeline. Although these requirements may not be enough to generate additional manpower, equipment or facility requirements, the marginal increase in workload and the turbulence created in the system by additional volumes of material ultimately decreases the effectiveness and productivity of both individuals and organizations.

2.2.1.1 Class III - Fuel. Fuel requirements were determined for each WS by multiplying usage times fuel consumption rates. Fuel consumption per day per WS was totaled to determine unit requirements. The methodology is summarized below. Detailed calculations are presented in Appendix D, Fuel Consumption Analysis to this report. The methodology used to calculate fuel consumption is summarized as follows:

- Determine system usage. The first step in determining fuel consumption is the calculation of system usage. Vehicle operating miles are the basis for determining fuel consumption for wheeled vehicles. Operating hours are the basis for determining fuel consumption for stationary equipment such as generators.

Operating hours and miles for combat vehicles were calculated from the NLOS-CA Operational Mode Summary/Mission Profile (OMS/MP). The NLOS-CA OMS/MP was applied to the LRSM as well, based on guidance from the USAIS, PM Mortar and the COEA study team. Calculations and analysis employed to derive system usage values are detailed in Appendix C, Mission Profile Analysis, to this report.

- Determine fuel consumption rates. Complete fuel consumption rates for equipment used in this study were not available from the US Army Petroleum Center. Rates were obtained from FM 10-13, Supply and Service Reference Data.
- Calculate Total Fuel consumption. Total consumption is calculated by multiplying consumption rates by vehicle usage and summing by equipment quantities in each unit.

Results of the Class III Analysis are summarized below in Table 2-1 (see Figure 2-1 Fuel Consumption Comparison):

TABLE 2-1

**FUEL CONSUMPTION SUMMARY
GAL PER BRIGADE PER DAY**

	L I G H T		H E A V Y	
	NLOS	LRSB	NLOS	LRSB
GALLONS PER DAY	245.75	245.75	485.18	851.72
TONS PER DAY	1738.9	1738.9	3241.00	6026.77

2.2.1.2 Class V - Ammunition. Daily ammunition consumption was calculated by Brigade for both NLOS-CA and LRSB systems using the following methodology. Detailed analysis is documented in Appendix E (Ammunition Consumption Analysis) to this report.

- Calculate daily ammunition consumption per WS for the NLOS-CA from the NLOS-CA OMS/MP (see Appendix C).
- Convert NLOS-CA consumption rates to LRSB consumption. Based on guidance from the USAIS and PM Mortar, the individual precision guided mortar munition is one half as effective as the FOG-M. Multiply NLOS-CA ammunition consumption by two to obtain the equivalent killing capacity for the LRSB.
- Calculate Brigade consumption. Ammunition daily consumption was multiplied by 12 WSs per brigade to determine Brigade consumption. Requirements for fractional pallets were rounded up to the next whole pallet and weight and volume were calculated based on whole pallet quantities.

FUEL CONSUMPTION GAL PER DAY PER BDE DIESEL

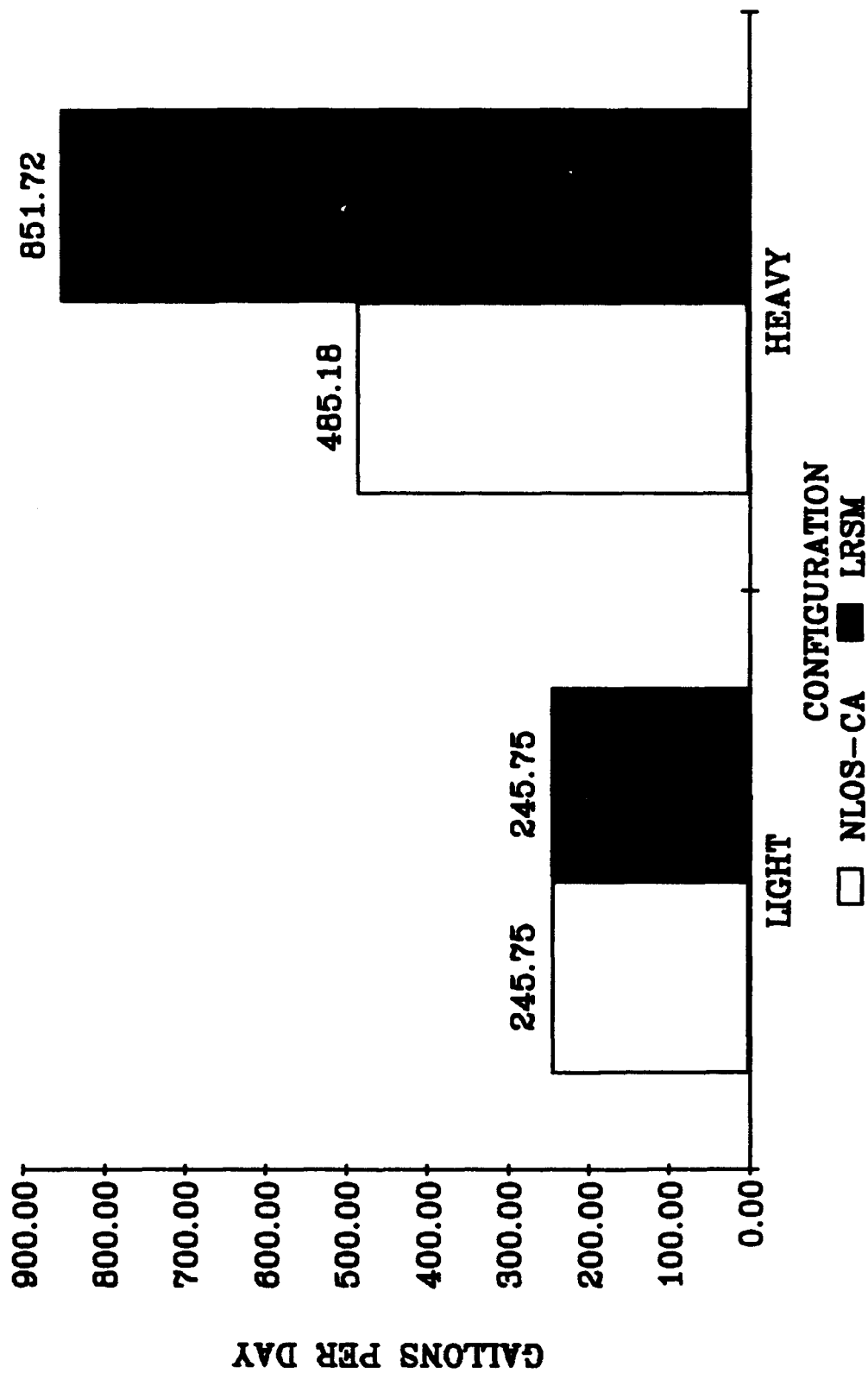


FIGURE 2-1 Fuel Consumption Summary

Results of this analysis are summarized as follows in Table 2-2 (see Figures 2-2 and 2-3 for ammunition consumption graphs):

TABLE 2-2
AMMUNITION CONSUMPTION
PER BRIGADE PER DAY
COMBAT SCENARIO

	LIGHT NLOS	LIGHT LRSM	HEAVY NLOS	HEAVY LRSM
ROUNDS	75	150	177	354
PALLETS	13	17	30	40
STONS	7.1	4.1	16.4	9.7
CUFT	531.7	758.2	1227.0	1784.0

Daily Class V tonnage consumed by the NLOS system is 35% to 40% greater than Class V tonnage consumed by the LRSM. However, the ammunition volume of the LRSM is 76% to 80% greater for the LRSM versus the NLOS. Because shipping volume is more critical to shipping capacity than tonnage, the logistics impact of LRSM ammunition consumption is greater than the impact of the NLOS.

2.2.2 Packaging, Handling and Storage (PHS). The PHS sub-analysis assessed the logistics impacts of process, procedures, equipment and supplies required to prepare and protect ammunition during shipment. Five MOPs were analyzed within the PHS sub-analysis:

- Individual Round Size
- Pallet Configuration
- Brigade Stowed Rounds
- Material Handling Equipment (MHE) Requirements
- Storage Requirements

2.2.2.1 Individual Round Size. The dimensions of the individual round affect the handling of the ammunition throughout the supply pipeline. They also affect the crew's ability to handle the ammunition in the anticipated field environment.

AMMUNITION CONSUMPTION PER DAY PER LIGHT BDE

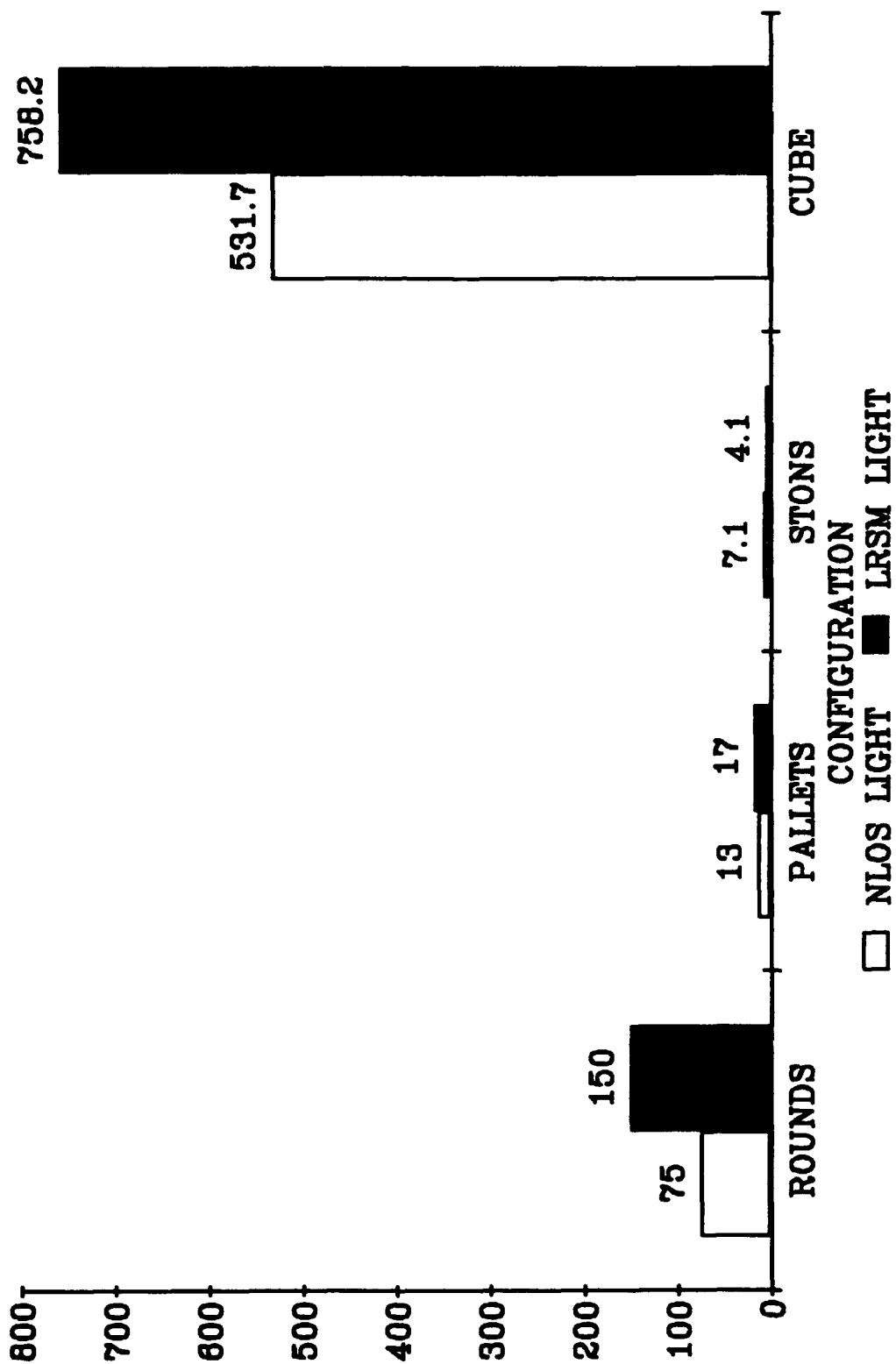


FIGURE 2-2 Ammunition Consumption Summary - Light Brigade

AMMUNITION CONSUMPTION PER DAY PER HEAVY BDE

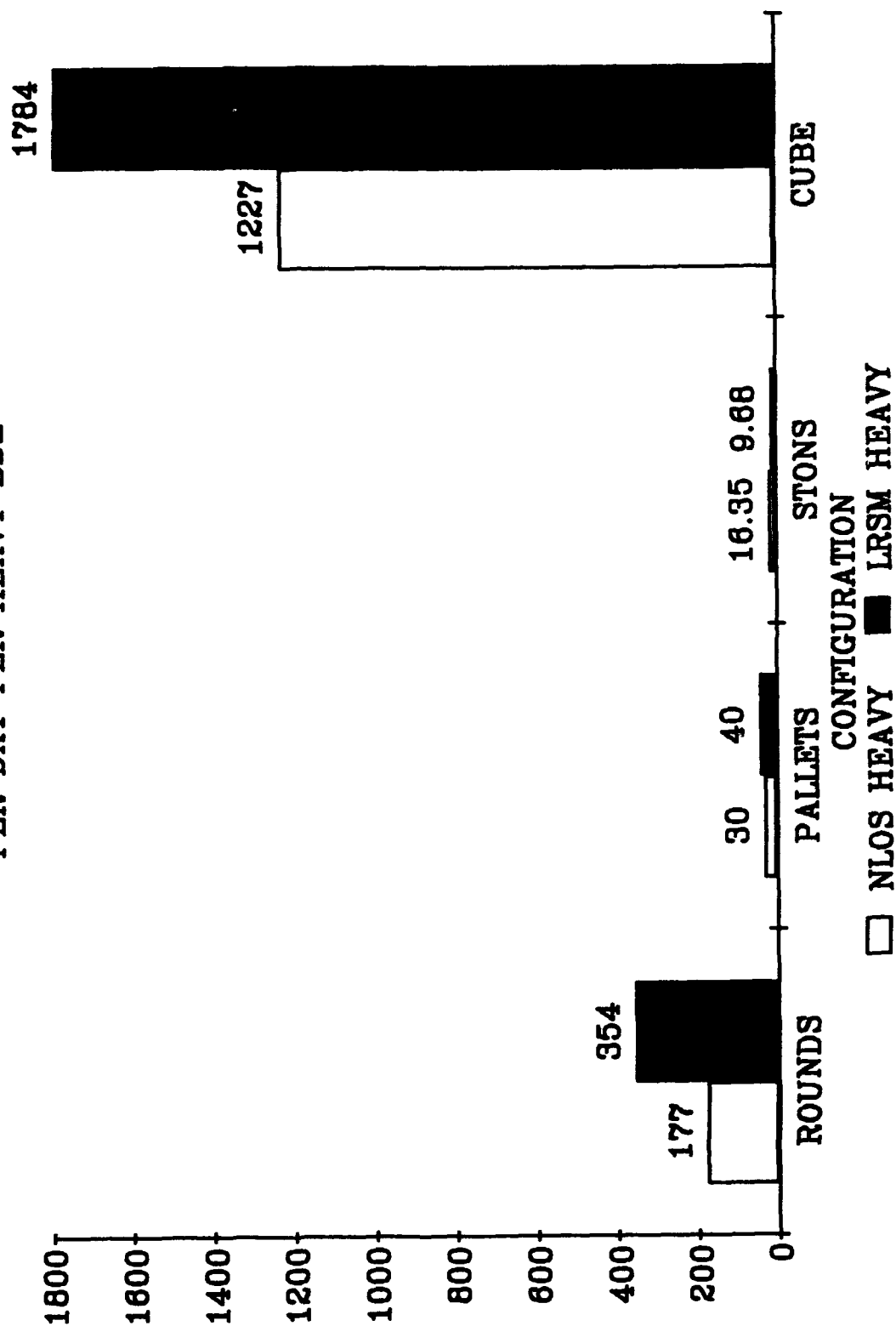


FIGURE 2-3 Ammunition Consumption Summary - Heavy Brigade

The dimensions of individual rounds are summarized below in Table 2-3 (see Figure 2-4 for individual round dimensions graphs).

TABLE 2-3
INDIVIDUAL ROUND DIMENSIONS
NLOS-CA and LRSM

	NLOS	LRSM
LENGTH (IN)	66	39
DIAMETER (IN)	6	4.72
CUFT	.36	.17
WEIGHT (LB)	82	40
EXPLOSIVE WT (LB)	10.94	5
TOT WT/EXPL WT (LB)	7.52	8
CUFT/EXPL WT (LB)	.033	.034

The LRSM round has not been defined. The dimensions of the STRIX round were used in this study in accordance with guidance provided by PM Mortar and the COEA Study Team. The NLOS-CA missile is larger than the LRSM smart mortar round in all dimensions, including explosive weight. There is a significant functional difference between the NLOS-CA missile and the LRSM smart mortar round. For that reason, direct comparison between the two rounds is difficult. To facilitate this comparison, ratios of total weight and volume to explosive weight have been used. These measure the size of the round relative to the killing power in the round. On this basis, both the NLOS-CA and LRSM rounds are similar. In summary, the logistics impact of the NLOS-CA round are greater than the logistics impact of the LRSM.

2.2.2.2 Pallet Configuration. Ammunition is managed and handled in pallet loads down to the field ammunition supply point. The dimensions and characteristics of the loaded pallet, therefore, have a significant impact on the logistics supportability of a WS. A comparison of ammunition pallet dimensions for the NLOS-CA and the LRSM are summarized below in Table 2-4 (see Figure 2-5 for ammunition pallet comparison graph).

INDIVIDUAL ROUND DIMENSIONS

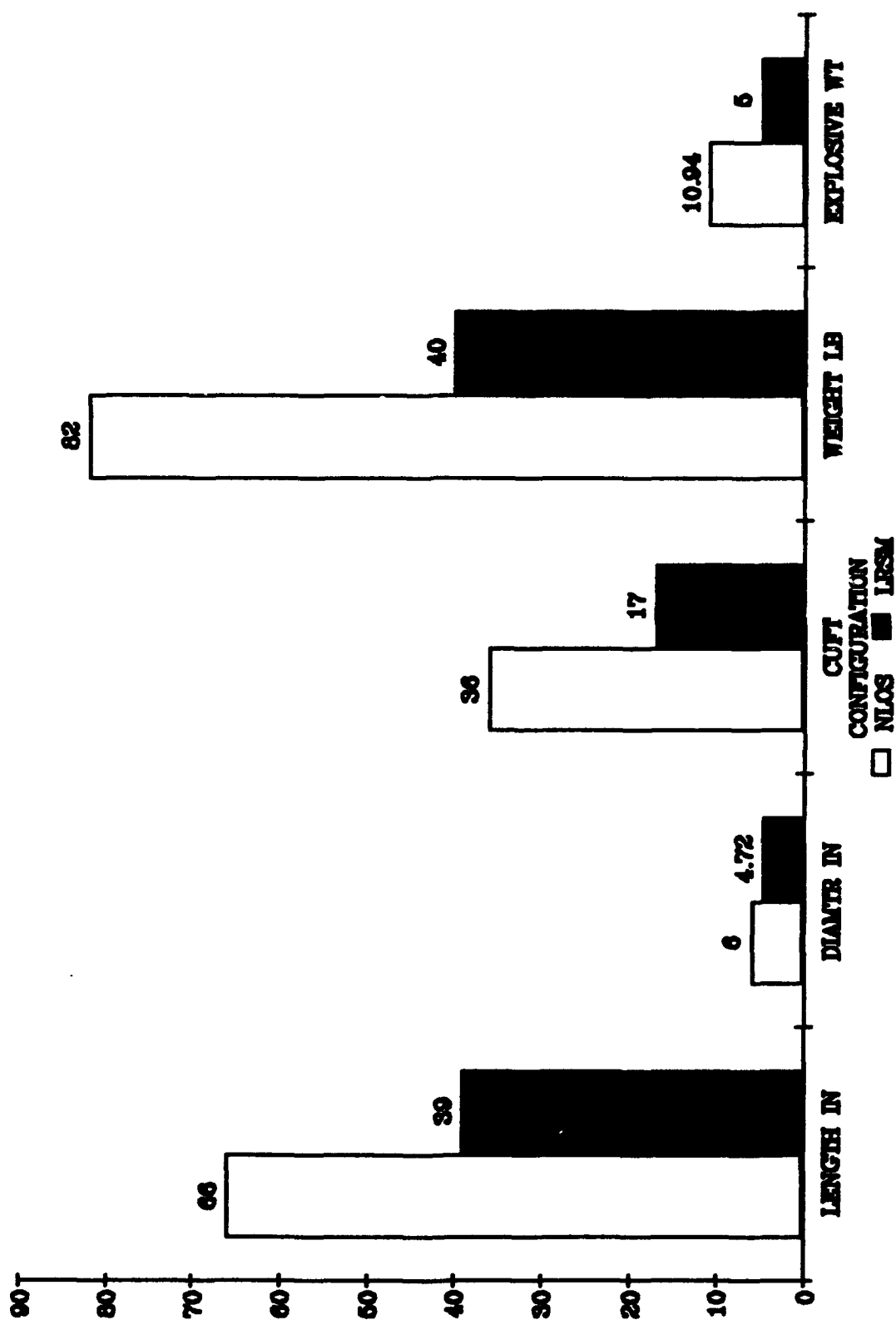


FIGURE 2-4 Individual Round Summary

TABLE 2-4

PHS
AMMO PALLET COMPARISON

	NLOS	LRSM
ROUNDS	6	9
LENGTH (IN)	86	43
WIDTH (IN)	64.5	39
HEIGHT (IN)	12.75	46
CUFT	40.9	44.6
TOT WEIGHT (LBS)	1088.2	484
EXPLOSIVE WEIGHT (LBS)	65.64	45

The NLOS-CA missile is transported and fired in a six round pack. Each missile pack constitutes a pallet load. The LRSM round has not been defined. The pallet configuration used for the STRIX mortar round has been used for this study in accordance with guidance by PM Mortar and the COEA Study Team. Pallet dimensions reflect the dimensions of the individual rounds. The total volume of the respective pallets is similar, however, the NLOS pallet consists of a single, long, thin package. The LRSM pallet is relatively square and much higher. The square shape of the LRSM pallet may support more efficient loading of multiple pallets. The total weight of the NLOS pallet is 225% greater than the LRSM pallet, which further limits flexibility in bulk loading confirmation. Cube and total weight to explosive weight ratios show the NLOS-CA pallet to be more efficient in terms of volume, but less efficient in terms of weight. In summary, the logistics impact of the NLOS-CA pallet is greater than the impact of the LRSM pallet.

2.2.2.3 Brigade Stowed Rounds. Rounds stowed or carried on WSs are a fixed component of each unit's basic load of ammunition. Stowed rounds must be handled by unit personnel and requirements must be supported by the supply system. Stowed round quantities were defined as 144 (12 rounds per each of 12 firing units) for the NLOS-CA. Notional LRSM WSs were defined as carrying 39 and 64 rounds per WS for light and heavy configurations, respectively. Twelve WSs were allocated to each Brigade. Total volume and total weight for the NLOS-CA was calculated based on a SIX missile package as the basic handling unit. Volume and weight for

AMMUNITION PALLET DIMENSIONS

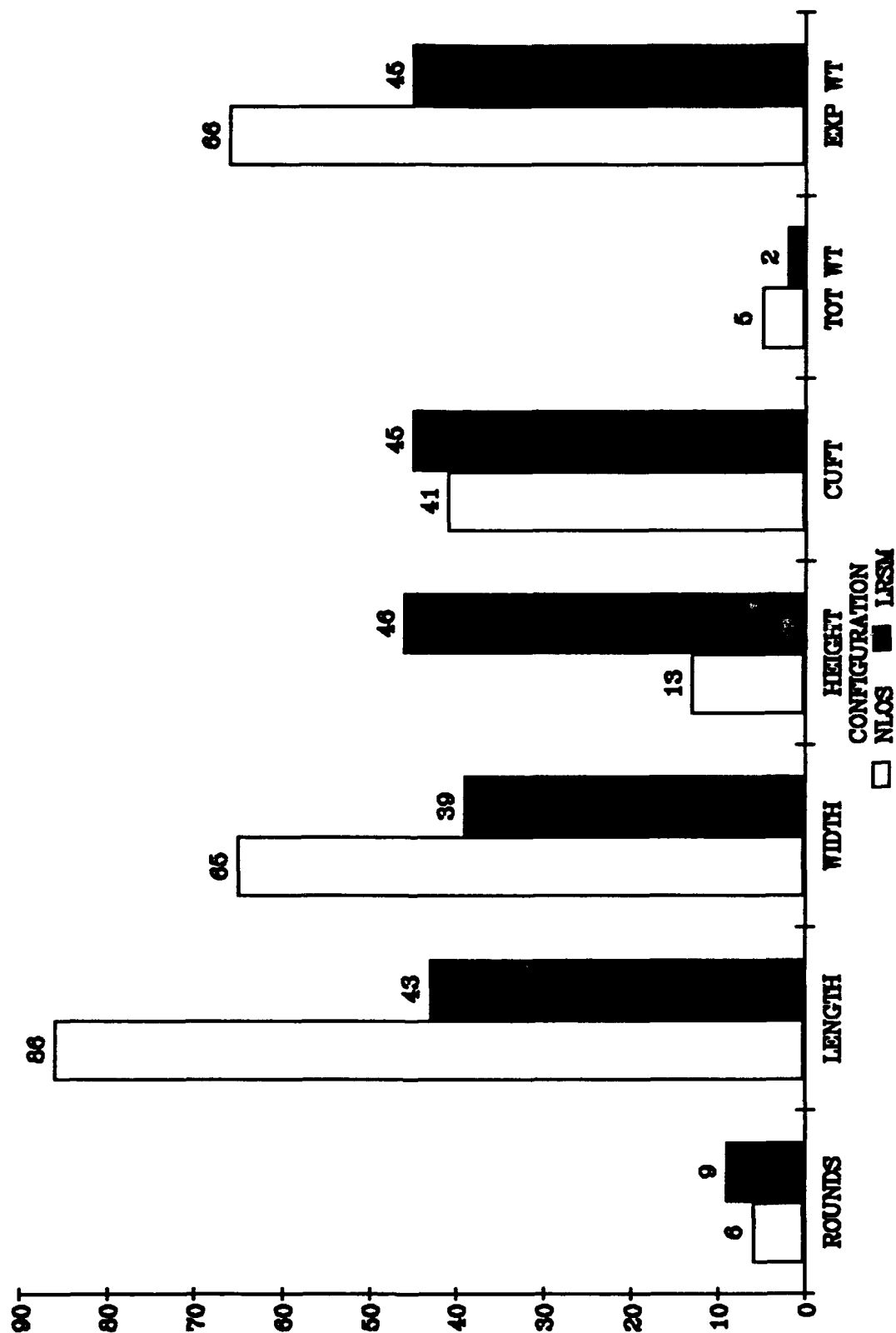


FIGURE 2-5 Pallet Comparison Summary

the LRSM rounds was calculated based on individual round containers. The PHS impacts for the Brigade level stowed round quantities are summarized below in Table 2-5 (see Figures 2-6, 2-7 and 2-8 for Brigade Stowed Load Comparison graphs):

TABLE 2-5

BRIGADE STOWED LOAD COMPARISON

	NLOS (Heavy & Light)	LIGHT LRSM	HEAVY LRSM
STOWED ROUNDS	144	468	768
CUFT	981.6	1675.44	2749.44
TOTAL WEIGHT (LBS)	26160	18720	30720

Volume increases directly with the number of rounds, while total weight is less for the light version of the LRSM versus the NLOS-CA WS. Although the unified container used for the NLOS missile creates some handling problems and drives requirements for MHE at the unit level, the LRSM has a greater logistics impact at Brigade level and below where bulk shipments must be broken down and rounds handled individually for on-board stowage. The logistics impact of the LRSM Brigade stowed round load is greater than the impact of the NLOS. Volume and weight for the stowed round quantities of the LRSM are greater than for the NLOS-CA for both light and heavy configurations reflecting higher stowed round requirements. The logistics impact of brigade stowed round loads for the LRSM is greater than the impact of NLOS stowed round load.

2.2.2.4 Material Handling Equipment (MHE) Requirements. The size, weight and volume of ammunition supplies require MHE at all levels above Brigade. Requirements for new or additional equipment can have a significant impact on units in terms of sustainment and mobility. Although somewhat larger, the LRSM is assumed to be similar to 120mm mortar rounds in the field or planned for issue. Standard procedures and MHE will be used at wholesale, bulk storage and handling points. Onboard storage is loaded by hand, one round at a time. NLOS-CA rounds are managed throughout the supply system on a six round, pallet-sized missile pack. This pack is assumed to be a standard pallet size and can be handled by issue MHE at bulk supply points. It cannot, however, be man-handled by the two man-crew. A hydraulic crane is required on the WS and in the field to pick-up and deliver missile packs as described by the current support concept. The logistics impact of the NLOS-CA system on MHE requirements is strongly greater than the impact of the LRSM.

STOWED ROUNDS

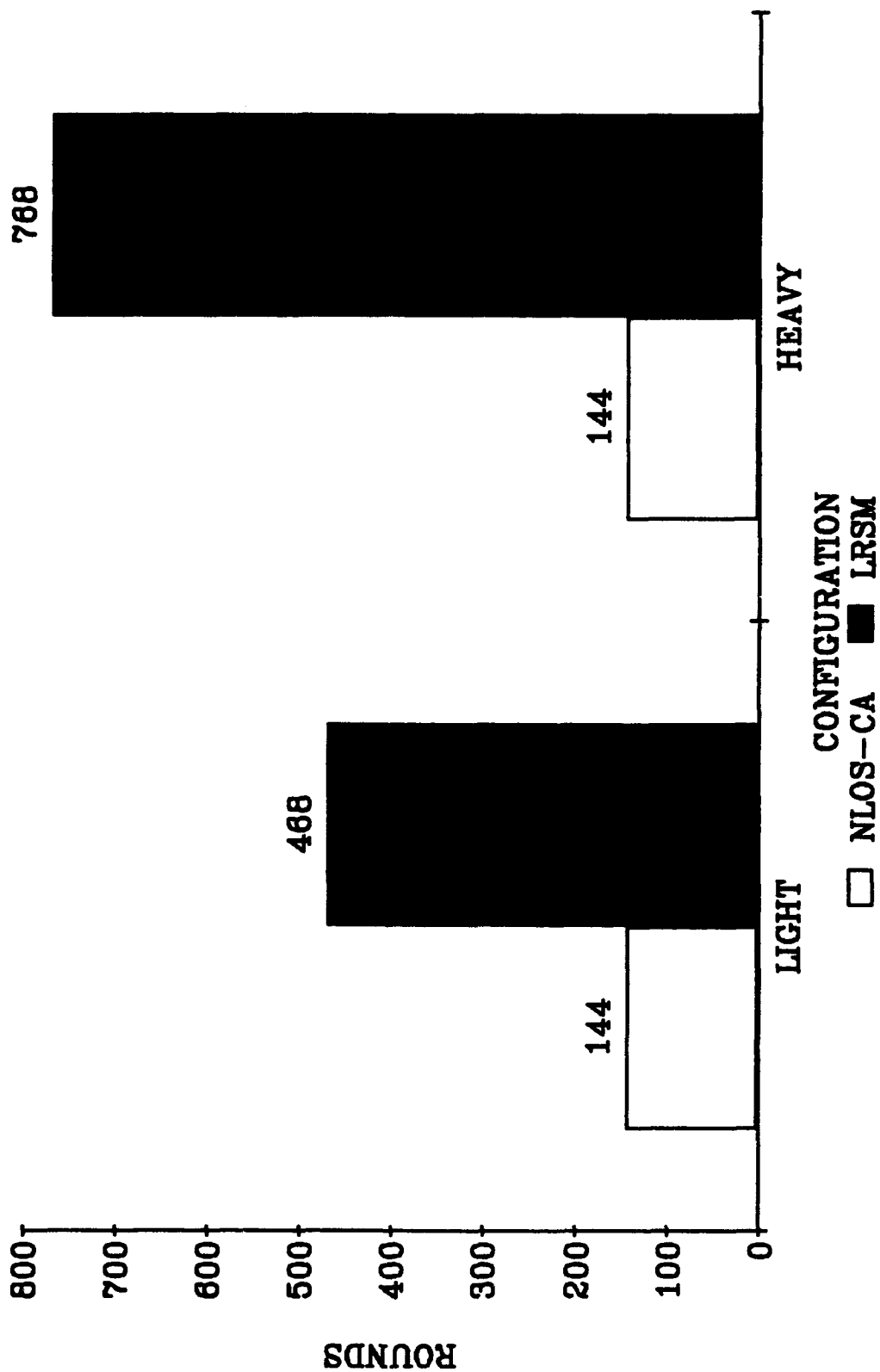


FIGURE 2-6 Brigade Stowed Rounds Comparison

STOWED ROUND VOLUME CUBIC FEET

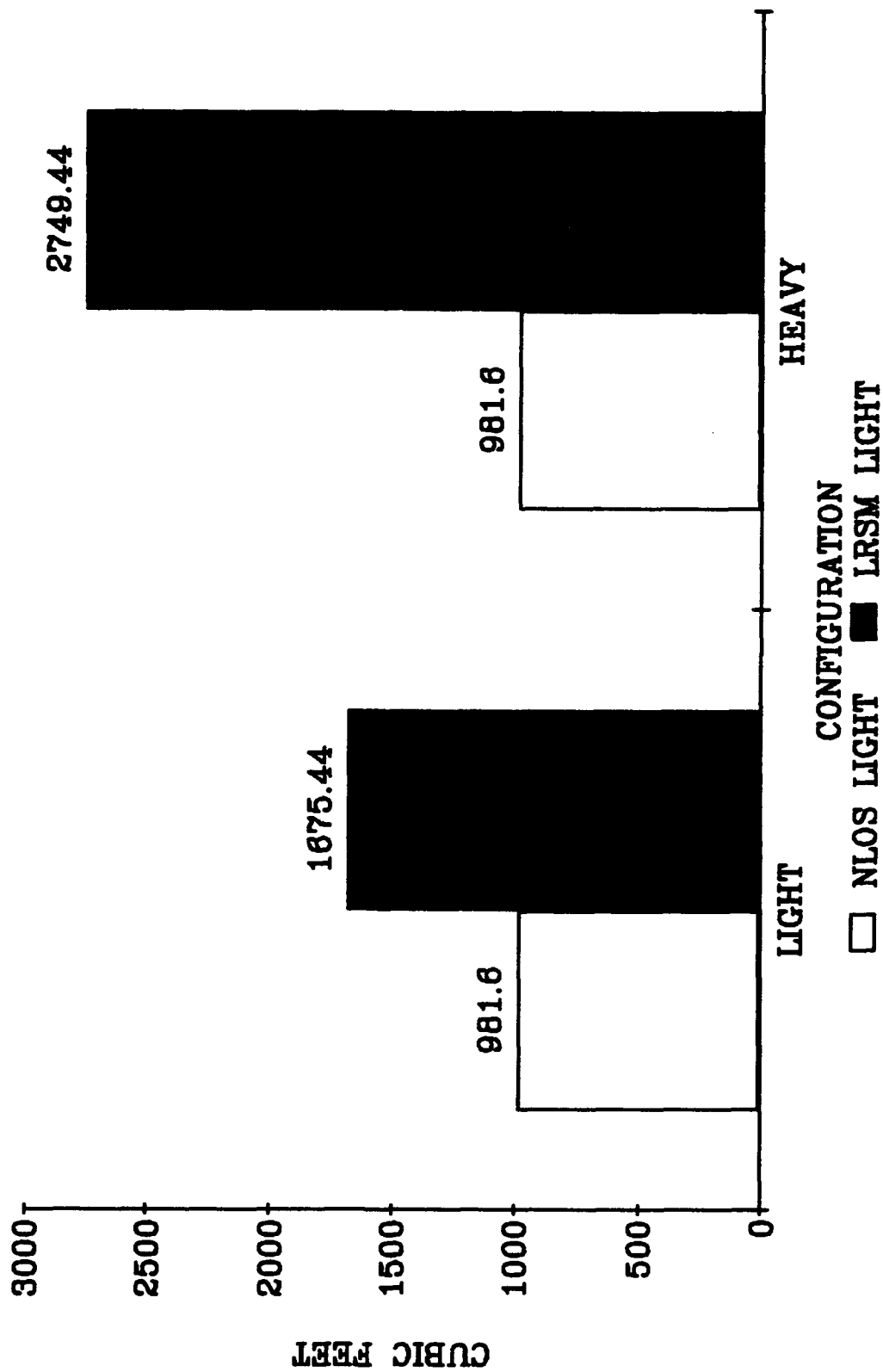


FIGURE 2-7 Brigade Stowed Rounds Volume

STOWED ROUND WEIGHT STONS

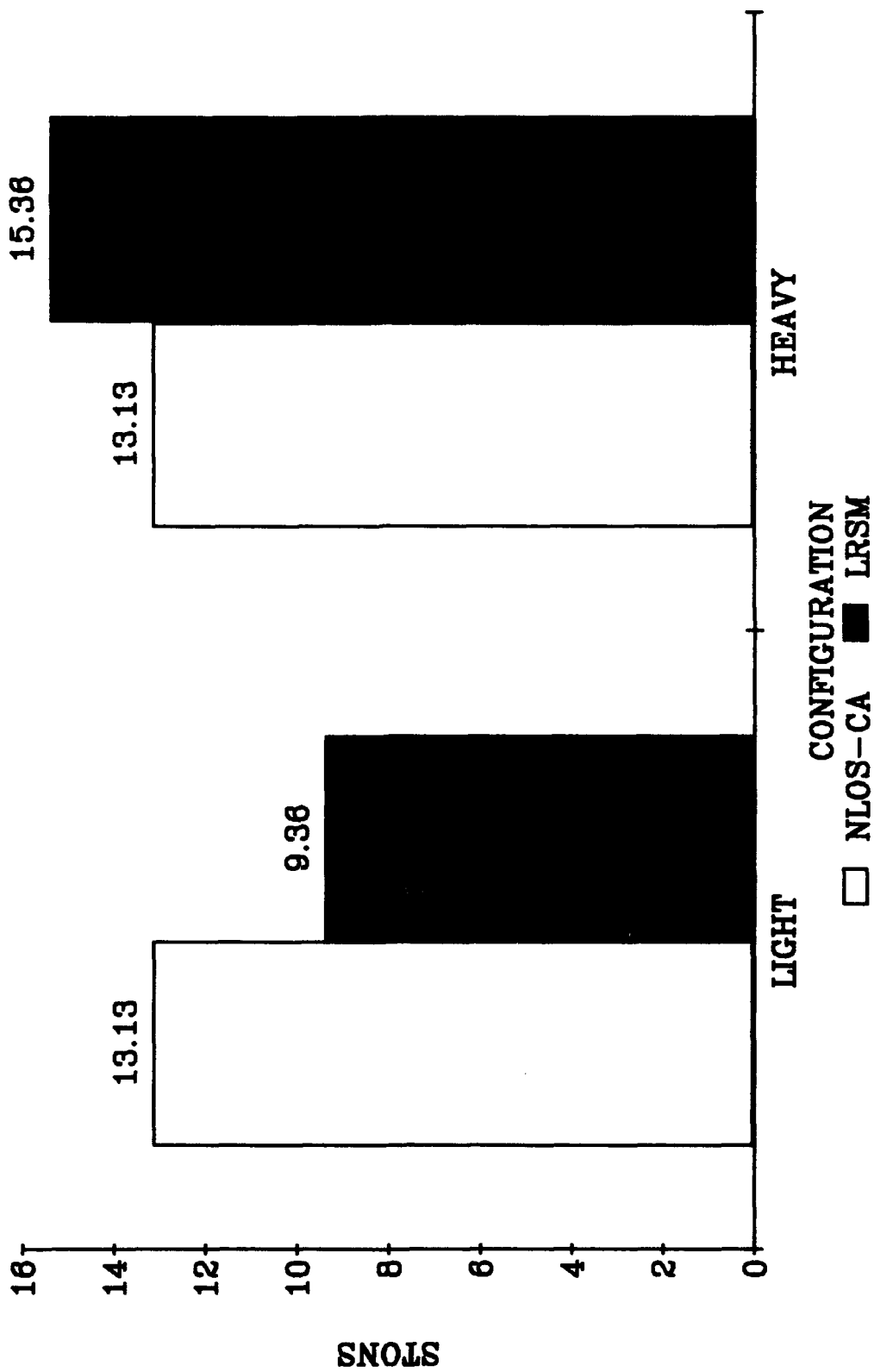


FIGURE 2-8 Brigade Stowed Rounds Weight

2.2.2.5 Storage Requirements. Unique or special storage requirements may have a significant impact on logistics support facilities and support requirements. Storage characteristic and requirements for the NLOS-CA and LRSM are summarized below in Table 2-6.

TABLE 2-6
NLOS-CA/LRSM STORAGE CHARACTERISTIC
AND REQUIREMENTS SUMMARY

VARIABLE	NLOS	LRSM
QTY-DISTANCE CLASS	1.1	1.1
COMPATIBILITY CATEGORY	E	D
MHE	ON-BOARD	NONE
HAZARDS	N/A	N/A
ENVIRONMENTAL CONTROL	N/A	N/A

Data for the NLOS-CA was provided by the USAOMMC&S and was certified by PM NLOS-CA. Data for the LRSM is based on the STRIX round and was provided by PM MORTAR. Quantity-distance classification determines storage configuration of bulk ammunition. Quantity-distance classifications are identical. Compatibility Category determines types of ammunition which can be stored in the same magazine in peacetime, or in the same stack in the field. Quantity-distance requirements must be applied when ammunition of different categories is stored together. Although compatibility categories are different, Table 2-6 FM 9-13 indicates there are no hazards. NLOS requires on-board MHE for loading/unloading missile packs onto the firing unit. This equipment is being acquired as part of the WS, however, logistics impact is included in consideration of that configuration. The difficulty of handling NLOS-CA missile packs can be compared to difficulties handling the LRSM missile Tube and base plate.

2.2.3 MAINTENANCE. Maintenance planning, organization, equipment and manpower for maintenance support is an important aspect of logistics supportability. The logistics concept determines how maintenance resources will be employed to achieve operational availability and readiness goals. Maintenance requirements which overload existing resources or require reconfiguration of maintenance support can have significant impact on the supportability of a WS individually and in the context of the total unit and total maintenance demands.

2.2.3.1 Test, Measurement, and Diagnostic Equipment (TMDE). TMDE is essential to the diagnosis and repair of "state of the art", high tech - electronics WSs now in the field. Requirements for new TMDE or additional TMDE equipment has a significant impact on logistics supportability. The logistics impact of TMDE becomes more critical as the fielding of new systems increases the demand on that equipment. The logistics impact of NLOS-CA alternatives was assessed in two dimensions:

- Type of TMDE.
- Quantity of TMDE.

The analysis addressed only system-specific TMDE requirements. NLOS-CA is an electronic-based system which relies heavily on TMDE for troubleshooting and maintenance. The Integrated Family of Test Equipment (IFTE) system will support NLOS-CA TMDE requirements. The Base Shop Test Facility (BSTF) provides Direct Support testing and repair of line replaceable units (LRUs). The Contact Test Set (CTS) will be used by forward support contact maintenance teams to augment on-board BIT capability for isolation of faulty LRUs. There are 13 LRUs in the gunner's station which will require TMDE support.

- 12 FUs per brigade x 14.8 operating hours per scenario/4 days per scenario = 44.4 brigade operating hours per day.
- 44.4 brigade operating hours per day/243 MTBUMA (FU) = .18 failures per day.
- .18 failures per day x 2.5 hrs per repair = .45 BSTF hours per day.
- .45 BSTF hours per day required/16 BSTF hours per day available per brigade = .03 BSTF per day required.

Although TMDE support requirements may not appear significant in the absolute, they must be assessed in the context of competing demands by other division WSs. In the current high-technology maintenance environment, each incremental addition to TMDE workload is significant. The LRSM does not require TMDE support. In summary, the logistics impact of NLOS-CA TMDE requirements is much stronger than the impact of LRSM requirements.

2.2.3.2 Built-in-Test/Built-in-Test Equipment (BIT/BITE). BIT/BITE identifies LRU failures automatically and assists the operator to isolate

the cause of those failures to components of the system. BIT/BITE is essential for electronics-based systems such as the NLOS-CA. BIT/BITE performance of the NLOS-CA system is summarized in Table 2-7 as follows:

TABLE 2-7

NLOS-CA BIT/BITE SUMMARY

DETECTION RATE	80%
FALSE ALARM RATE	5%
RESOLUTION	90% DETECTED FAILURES TO 1 LRU
SOURCE: PARA 3.5.1 MIS46200.	

The LRSM is a mechanical system which does not require BIT/BITE. Because of the difference in technology and fault detection requirements, BIT/BITE is not directly comparable for these alternatives. No comparison rating was assigned for this MOP.

2.2.3.3 Maintenance Concept. The maintenance concept determines where each level and category of maintenance will be performed. The maintenance concept determines maintenance organization and the allocation of manpower requirements.

A. NLOS-CA. NLOS-CA will be supportable by the standard Army logistics systems. The standard four level maintenance support concept will be applied to NLOS-CA GFE (vehicle, radio, MHE, etc.). The NLOS FU will employ a three level maintenance concept: Unit, Direct Support (DS) and Depot. There is no organic maintenance capability for NLOS FU in the NLOS Company. Operators will detect LRU failure via BIT/BITE. Maintenance will be provided by Forward Support Contact Teams (FSCTs) from the Forward Support Base (FSB). These teams will use the CTS to augment BIT isolation of failed LRUs. They will remove and replace failed LRUs. The BSTF provides diagnostics and repair of failed LRUs. Failed shop replaceable units (SRUs) are repaired at Depot.

B. LRSM. The LRSM will employ the standard four-level (Unit, DS, General Support (GS), and Depot) maintenance concept. Unit level maintenance of mortar is negligible. DS and GS maintenance/repair of LRSM tube is the same as that for the 120mm mortar tube. There is no field maintenance authorized for either the LRSM or NLOS round. They will both be certified rounds. Maintenance concepts for Alternatives 1 and 2 can be summarized as follows: No non-standard/unique facilities or equipment will be required to support either alternative.

The maintenance concepts for both NLOS-CA and LRSM are summarized in Table 2-8.

TABLE 2-8

MAINTENANCE CONCEPT SUMMARY

SYSTEM	L I G H T		H E A V Y		R O U N D	
	NLOS	LRSM	NLOS	LRSM	NLOS	LRSM
UNIT	FSB	N/A	FSB	N/A	N/A	N/A
DS	FSB	MSB	FSB	MSB	N/A	N/A
GS	N/A	GS UNIT	N/A	GS UNIT	N/A	N/A

The LRSM will fit completely within the existing maintenance organization and concept. The NLOS-CA on the other hand will increase the maintenance burden on FSCTs significantly. In addition, the NLOS-CA will increase the support burden on the BSTF direct support facility. The logistics impact of the NLOS-CA maintenance concept is very strongly greater than the LRSM impact.

2.2.4 Reliability, Availability and Maintainability (RAM). RAM measures operational readiness, mission success, maintenance manpower requirements and logistics support requirements. They ultimately determine quantities of repair parts and maintenance manpower requirements. RAM data for the NLOS-CA and LRSM were obtained from Mortar, NLOS-CA and Carrier Program Offices. Raw data used in this analysis is provided in Appendix F. The results are summarized below in Table 2-9:

TABLE 2-9

RAM SUMMARY NLOS-CA and LRSM

		Light & Heavy N L O S	L R S M	
			LIGHT	HEAVY
MTBOMF		161	152	79.8
MTBUMA		22.9	26.4	13.1
MTTR	UL	.72	1.4	N/A
	DS	2.25	2.1	N/A
	GS	5.5	5.5	N/A
MR		.12	.13	.38
A ₀		.93	.97	.91

2.2.4.1 Mean Time Between Operational Mission Failure (MTBOMF). MTBOMF is a measure of mission success. It is the period between failures which prevent the system from performing its mission. The interval between operational mission failures is measured in hours, miles and rounds for the NLOS-CA, carrier subsystems and mortar tubes respectively. These values were converted to hours as described in Appendix F RAM Analysis to this report. MTBOMF reflects both the supportability impacts and the operational effectiveness impacts of the WSs. A lower MTBOMF value indicates more frequent operational failures, and drives more maintenance and system downtime. The period between operational failures for the heavy LRSM is more than half that of the NLOS-CA. The MTBOMF of the light version of the LRSM is only somewhat less than that for the light version of the NLOS. This reflects the impact of the carrier on reliability of the WS (see Figure 2-9 for MTBOMF hours graph). In summary, the logistics impact of the MTBOMF of the LRSM is moderately greater than the impact of the NLOS-CA.

2.2.4.2 Mean Time Between Unscheduled Maintenance Actions (MTBUMA). MTBUMA is a measure of maintenance manpower requirements. It measures the frequency of maintenance actions. The smaller the interval between unscheduled maintenance actions, the more frequently maintenance support will be required, and the greater the logistics impact. The MTBUMA for the NLOS-CA is somewhat less than the light version of the LRSM, but approximately 69% greater than the heavy version (see Figure 2-10 for MTBUMA hours graph). In summary, the logistics impact of the LRSM is moderately greater than the impact of the NLOS-CA.

2.2.4.3 Mean Time To Repair (MTTR). MTTR measures the average time required to complete a maintenance action. Combined with MTBUMA it determines maintenance workload (See graph at Figure 2-11). The MTTR is approximately equal for the light versions of the NLOS-CA and LRSM, reflecting the dominance of the carrier in assessing the maintainability of both systems. MTTR data was not available for the heavy version of the LRSM. In summary, the logistics impact of MTTR is equal for both NLOS-CA and LRSM.

2.2.4.4 Maintenance Ratio (MR). The MR measures maintenance workload per operating metric. System level MR for both alternatives are summarized as follows (see Figure 2-12 for MR graph). MRs for light versions of the alternatives are approximately equal. The Heavy version of the LRSM has a much higher MR than the light versions of either alternative. This reflects the impact of carrier maintenance for the tracked LRSM vehicle.

MEAN TIME BETWEEN MISSION FAILURE (MTBOMF) HOURS

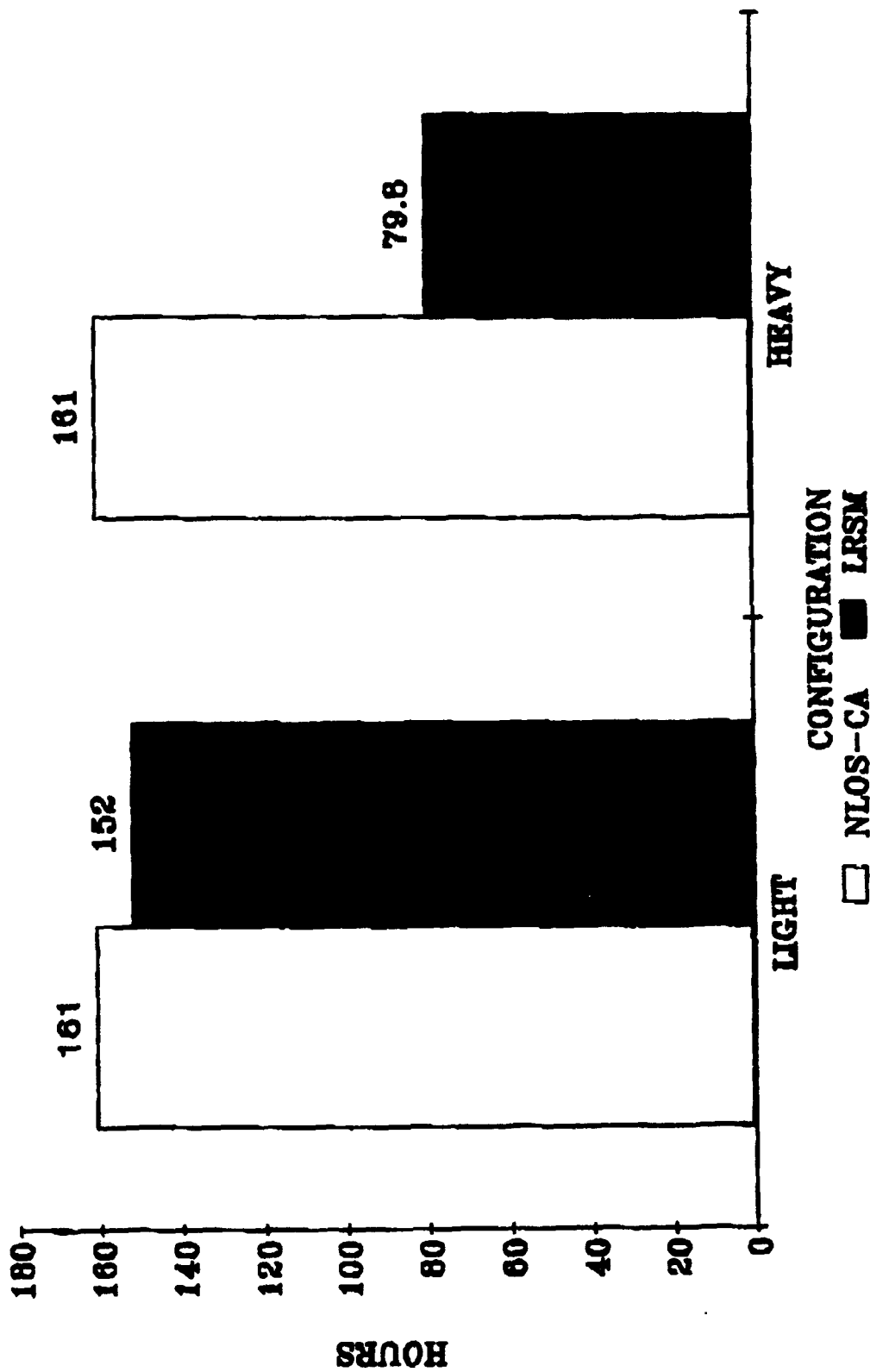


FIGURE 2-9 MTBOMF Comparison

MEAN TIME BETWEEN MAINTENANCE ACTIONS (MTBUMA) HOURS

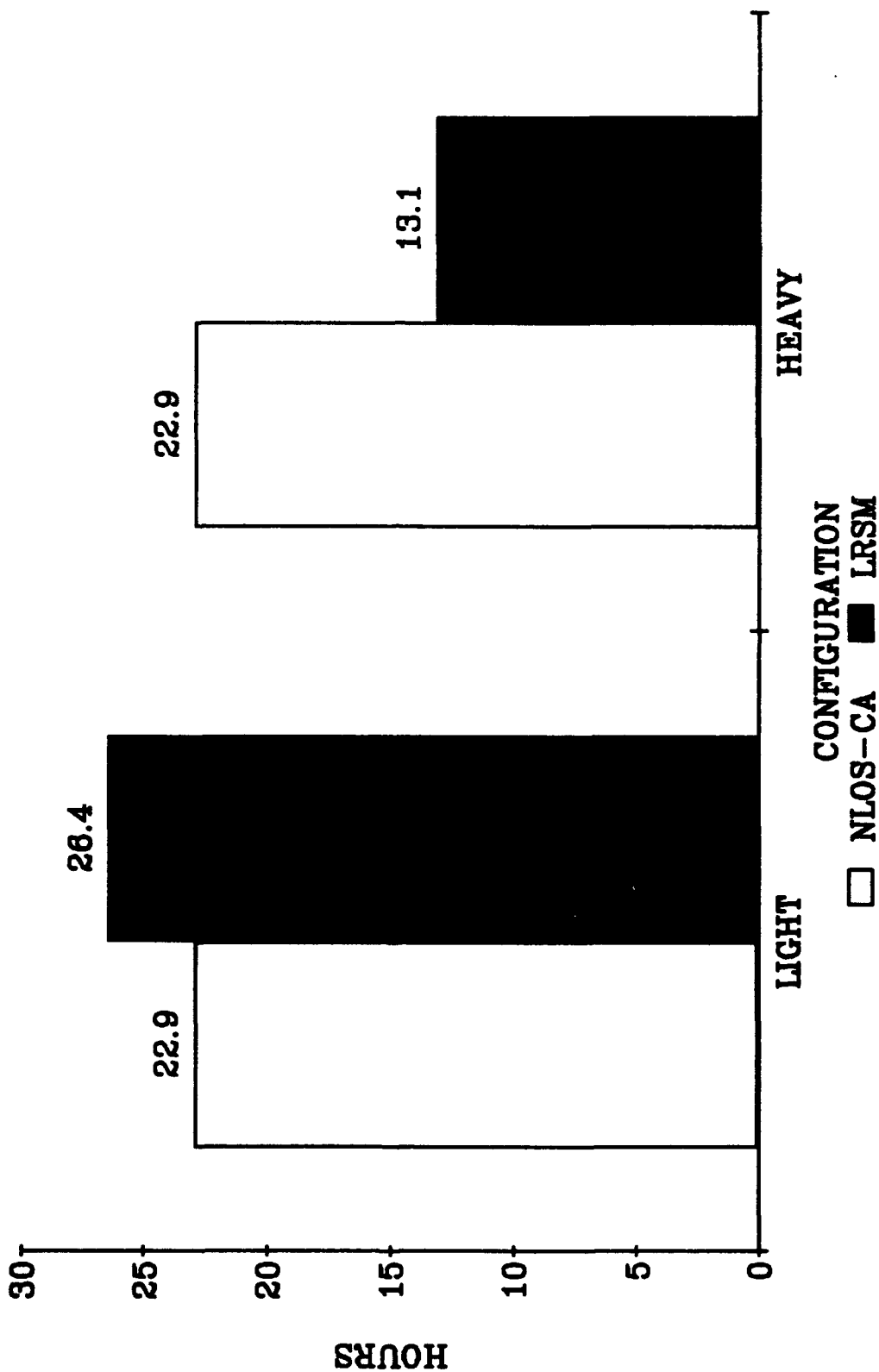


FIGURE 2-10 MTBUMA Comparison

MEAN TIME TO REPAIR (MTTR) HOURS

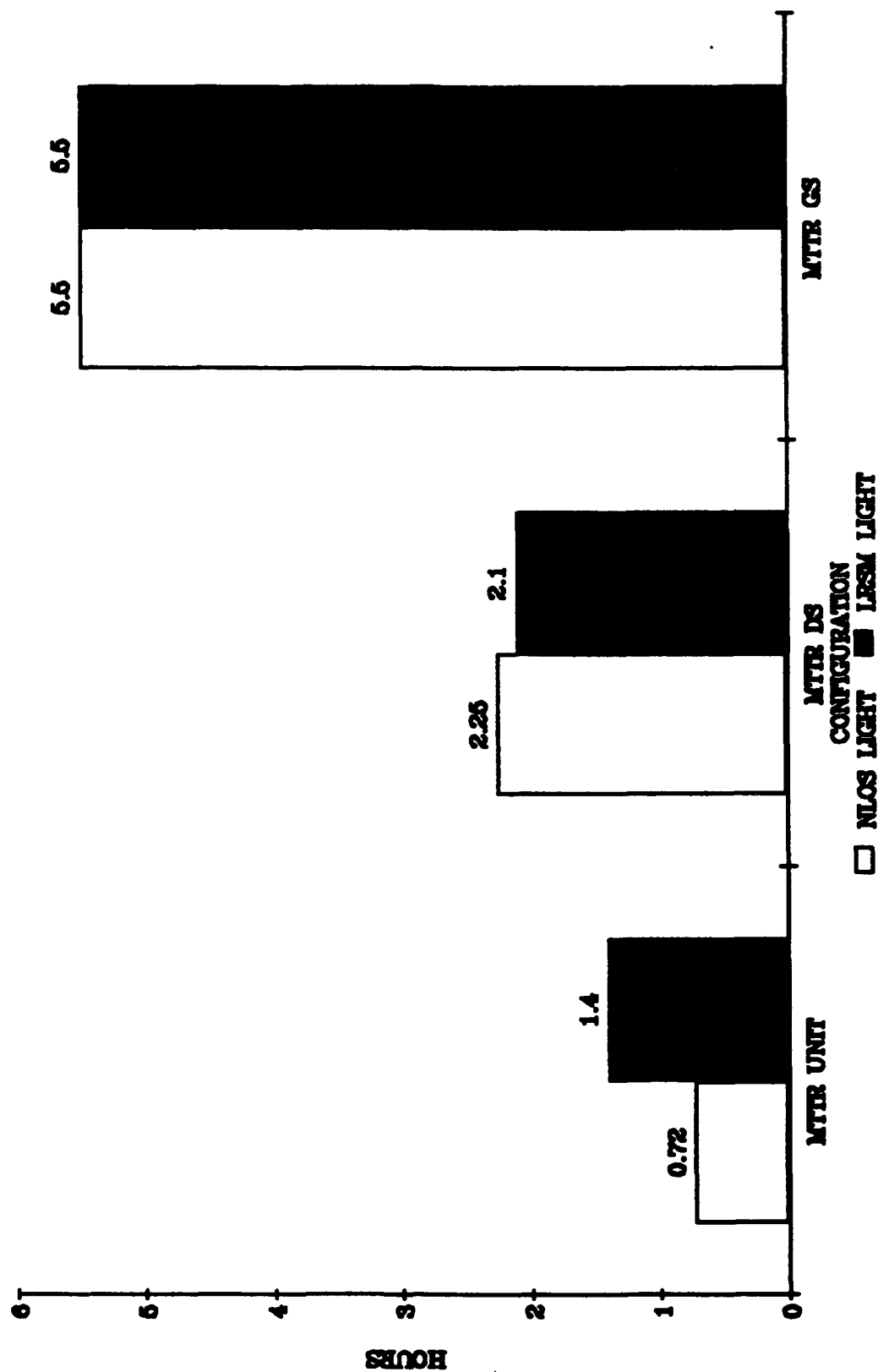


FIGURE 2-11 MTTR Comparison

MAINTENANCE RATIO (MR) MANHOURS PER OPERATING HOUR

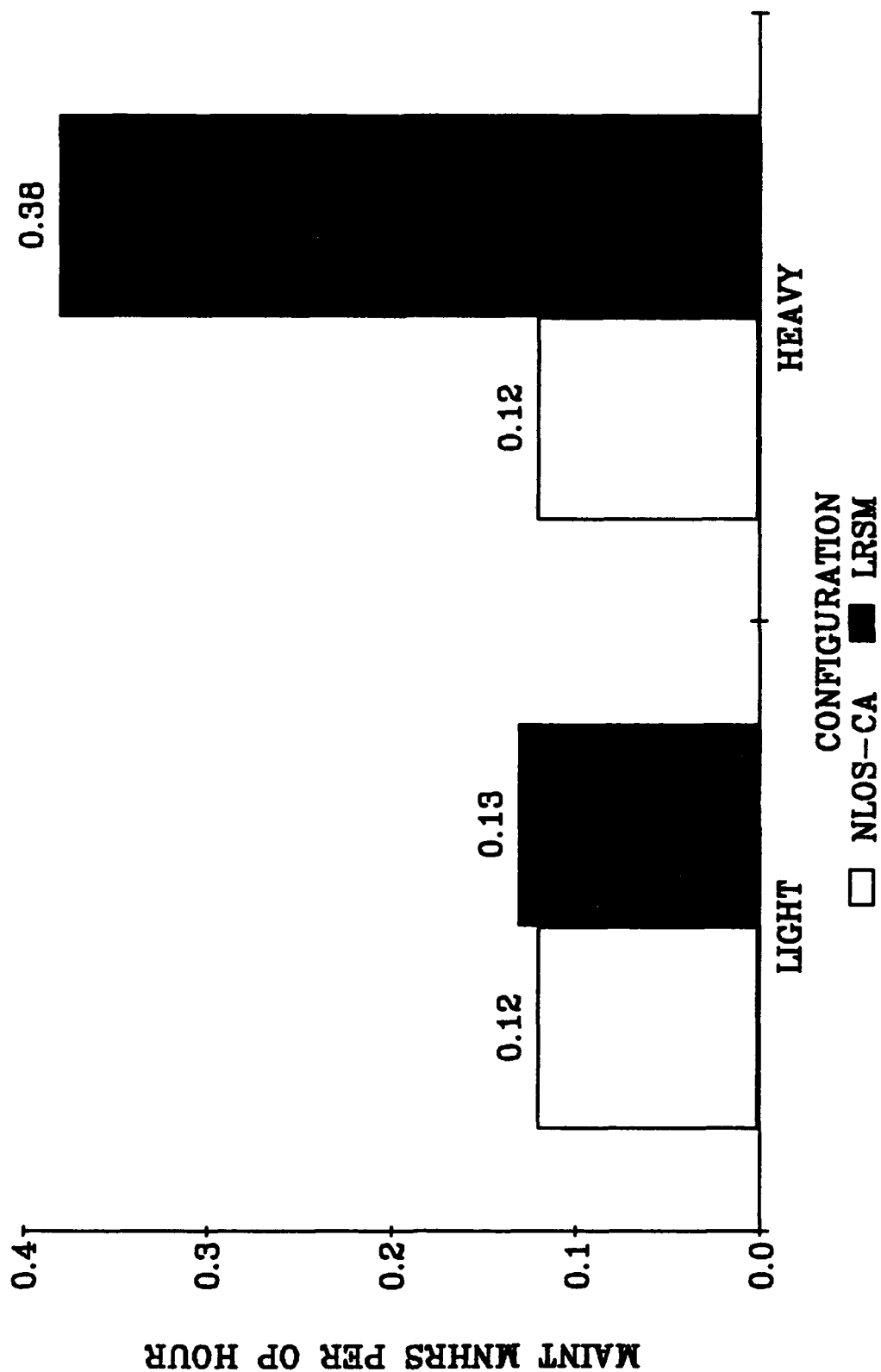


FIGURE 2-12 MR Comparison

2.2.4.5 Operational Availability (A_o). A_o represents the portion of time a system is either operating or capable of operating in a specific operating and support environment. A_o is calculated as follows:

$$A_o = \frac{\text{Operating Time} + \text{Standby Time}}{\text{Operating Time} + \text{Standby Time} + \text{Total Corrective Maintenance Time} + \text{Total Preventive Maintenance Time} + \text{Admin \& Logistics Downtime}}$$

As the equations above demonstrate, A_o is a function of all other RAM values and as such, is the only MOE addressed in this LIA study. For this study, A_o values were provided by Mortar and NLOS-CA program offices. A_o for the NLOS-CA is approximately equal to the heavy version of the LRSM and less than the light version reflecting the supportability impact of the NLOS and the Heavy LRSM. In summary, the logistics impact of the A_o of the NLOS-CA is marginally greater than the impact of the LRSM.

2.2.4.6 Direct Productive Annual Maintenance Man-hours (DPAMMH) Comparison. DPAMMH measures the total maintenance workload of a WS. It measures the direct impact of a WS on the maintenance force structure. The DPAMMH by MOS and maintenance level were provided for each WS by respective program managers. Raw data used in this analysis is displayed in Appendix F. The DPAMMH for the NLOS-CA and LRSM WSs and major components is summarized in Table 2-10 (see Figure 2-13 for graphical comparison).

TABLE 2-10
DIRECT PRODUCTIVE ANNUAL MAINTENANCE MAN-HOURS
SUMMARY BY SYSTEM

L I G H T						
MAINT LEVEL	N L O S			L R S M		
	SYSTEM	FU	VEH	SYSTEM	TUBE	VEH
UNIT	240	---	240	240	- - -	240
DS	1875	725	1150	1163	13	1150
GS	87	---	87	96.5	9.5	87
TOTAL	2202.0	725	1477	1499.5	22.5	1477
H E A V Y						
MAINT LEVEL	N L O S			L R S M		
	SYSTEM	FU	VEH	SYSTEM	TUBE	VEH
UNIT	240	---	240	1076.7	- - -	1076.7
DS	1875	725	1150	237.8	16.8	221.1
GS	87	---	87	160.0	11.2	148.8
TOTAL	2202	725	1477	1474.5	28.0	1446.6

DIRECT PRODUCTIVE MAINTENANCE MANHOURS

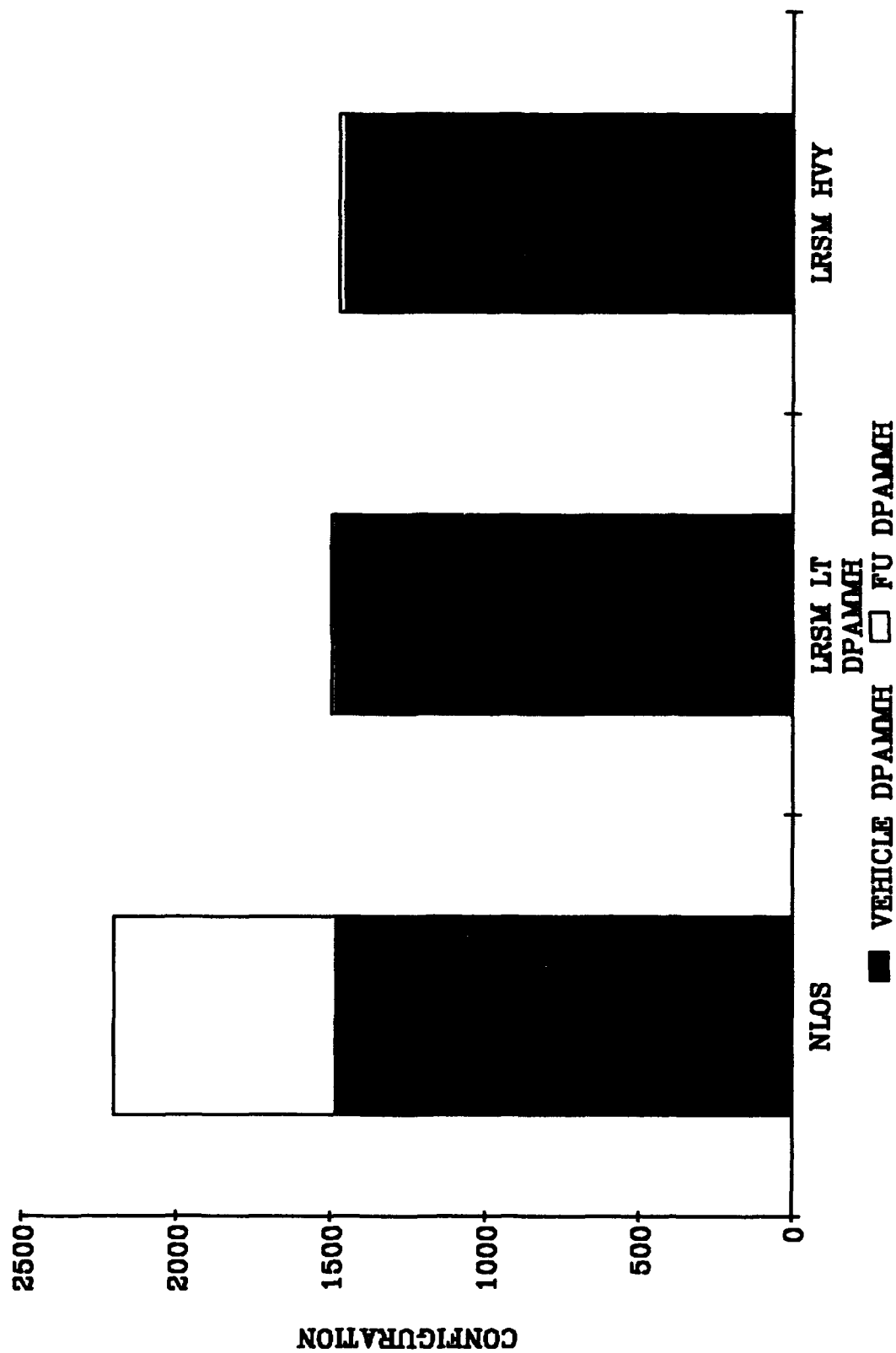


FIGURE 2-13 DPMMH Summary

By inspection, the direct maintenance workload for the LRSM is 30% lower than the NLOS-CA in both heavy and light configurations. Further analysis shows that this difference is due almost entirely to the maintenance requirements of the NLOS firing unit. The maintenance workload of both HHV and M1064 carriers is similar for both WSS. However, the maintenance requirements of the mortar are much less than the maintenance requirements of the NLOS-CA gunner's station and launcher. Because there is no unit level maintenance support capability at the organizational level, unit level maintenance workload is allocated to the direct support level. Therefore, the impact of the difference in DPAMMH falls almost entirely on the DS organization. The impact of the differences in DPAMMH between the two alternative systems becomes more pronounced when total DPAMMH is compared at the Brigade level. Total brigade maintenance workload is summarized in Table 2-11. Twelve NLOS systems and six LRSMs will be fielded in each Brigade, respectively.

TABLE 2-11

DIRECT PRODUCTIVE ANNUAL MAINTENANCE MAN-HOURS
SUMMARY BY BRIGADE

H E A V Y						
MAINT LEVEL	N L O S			L R S M		
	SYSTEM	FU	VEH	SYSTEM	FU	VEH
UNIT	2880	0	2800	12920	0	12920
DS	22500	8700	13800	28545	202	2653
GS	1044	0	1044	1920	134	1786
TOTAL	26424	8700	17724	17695	336	17359
L I G H T						
MAINT LEVEL	N L O S			L R S M		
	SYSTEM	FU	VEH	SYSTEM	FU	VEH
UNIT	2880	---	2800	2880	- - -	2880
DS	22500	8700	13800	13956	156	13800
GS	1044	---	1044	1158	114	1044
TOTAL	26424	8700	17724	17994	270	17724

- Three each 120 mm LRSM systems per Battalion, two infantry Battalions per Heavy Brigade.
- Although a light Brigade has three infantry Battalions, LRSM

fielding will be achieved by fielding two additional 120mm mortar systems and the conversion of one existing system in each Brigade.

The differences in maintenance impact are apparent. In summary, the logistics impact of NLOS-CA DPAMMH requirements is moderately greater than the impact of LRSM requirements.

2.2.5 Transportation

2.2.5.1 **Class III - Fuel.** The 2500 gallon tanker is used to transport bulk fuel forward from the Corps. Based on guidance from the U.S. Army Quartermaster School, tanker availability is 90% and each tanker completes 2 round trips per day. Daily Brigade fuel consumption requirements were calculated in the supply analysis detailed in **Appendix D** and summarized in Paragraph 2.3.2 above.

Tanker support requirements were calculated as follows and summarized in **Table 2-12** below (see **Figure 2-14** for Fuel Transportation Requirements graphic comparison):

Payloads per day = (Gallons per day consumption/2500 gallons per payload)

Tankers per day = (Payloads per day/2 Payloads (trips) per day per Tanker) x 1.10

TABLE 2-12

CLASS III TRANSPORTATION REQUIREMENTS SUMMARY

	L I G H T		H E A V Y	
	NLOS	LRSM	NLOS	LRSM
GAL PER DAY PER BDE	245.75	245.75	485.18	851.72
GAL PER TANKER	2500	2500	2500	2500
PAYLOADS PER DAY	0.098	0.098	0.183	0.341
TRIPS PER DAY	2	2	2	2
TANKERS PER DAY	0.054	0.054	0.101	0.187

2.2.5.2 **Class V - Ammunition.** The Palletized Load System (PLS) will be used to move ammunition requirements forward from Corps storage facilities. The PLS consists of a prime mover and a trailer. Payload capacities of both components are identical. The payload dimensions of the PLS and trailer are summarized in **Table 2-13** below:

FUEL TRANSPORTATION REQUIREMENTS TANKER PER DAY PER BDE

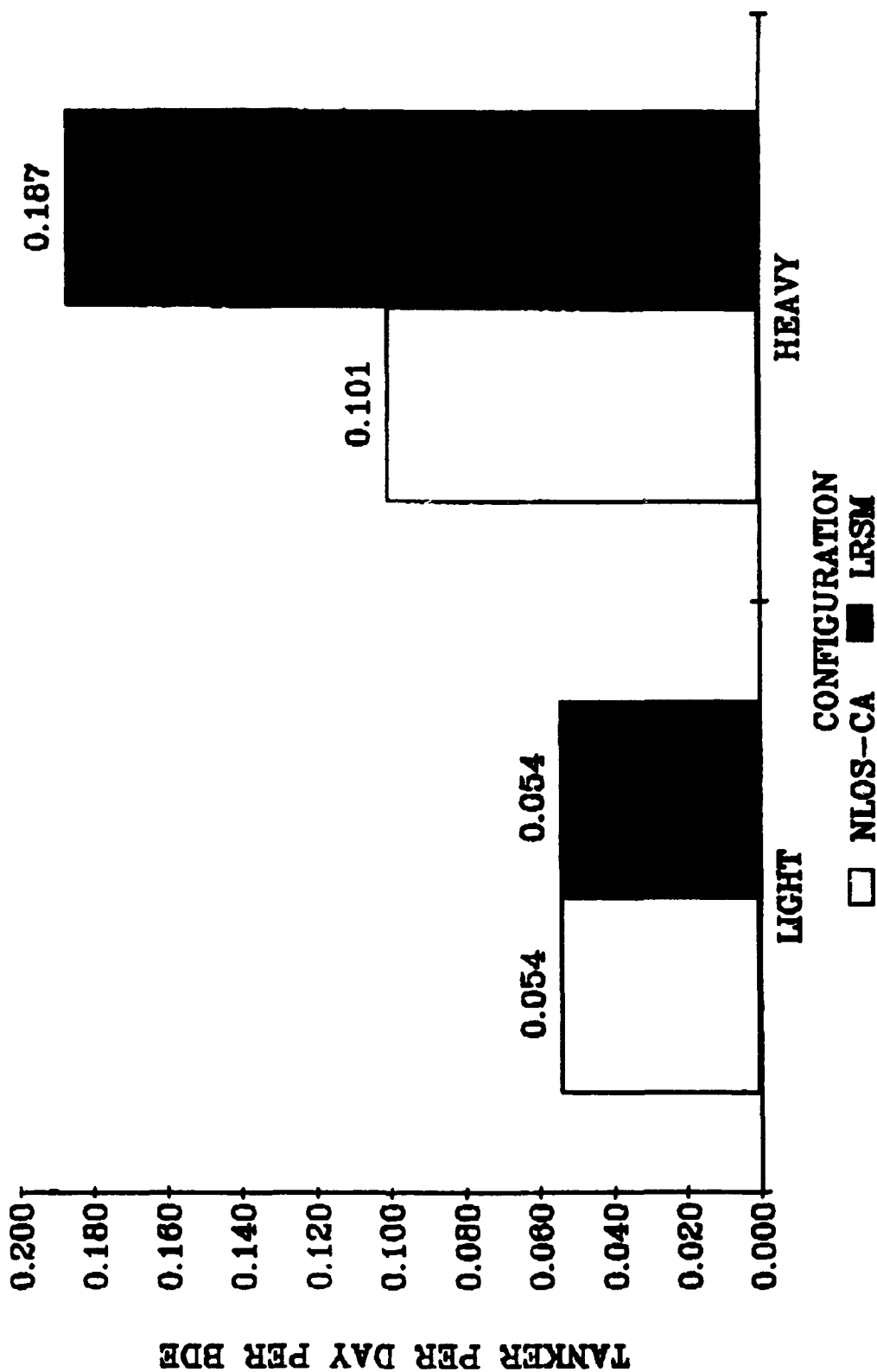


FIGURE 2-14 Fuel Transportation Summary

Table 2-13

PLS PAYLOAD DIMENSIONS SUMMARY
(Prime mover and trailer)

WIDTH (IN)	LENGTH (IN)	HEIGHT (IN)	STONS
90.5	249	63.7	16.5

Hauling capacity for LRSM and NLOS is calculated as follows:

LRSM

LRSM Pallet Dimensions: Width = 39 in
Length = 43 in
Height = 46 in
Weight = 484 lbs

LRSM Payload dimensions:

Payload width/pallet width = 2.3, 2 pallets wide.
Payload length/pallet length = 5.79, 5 pallets long
Payload height/pallet height = 1.38, 1 pallet high

Prime Mover Payload Capacity = 2x5x1 = 10 pallets per truck
Trailer Payload Capacity = 2x5x1 = 10 pallets per trailer
TOTAL PLS Capacity = 20 LRSM pallets

Weight Check= 20 pallets x 484 lbs per pallet/2000 lbs per ton =
4.84 tons < 16.5 ton capacity.

NLOS

NLOS Pallet Dimensions: Width = 64.5 in
Length = 86in
Height = 12.75 in
Weight = 1020 lb

NLOS Payload dimensions:

Payload width/pallet width = 1.4, 1 pallet wide.
Payload length/pallet length = 2.89, 2 pallets long
Payload height/pallet height = 4.99, 4 pallet high

Prime Mover Payload Capacity = 1x2x4 = 8 pallets per truck
Trailer Payload Capacity = 1x2x4 = 8 pallets per trailer
TOTAL PLS Capacity = 16 LRSM pallets

Weight Check = 8 pallets x 1020 lbs per pallet/2000 lbs per ton =
4.08 tons < 16.5 ton capacity.

Transportation support requirements were calculated as follows:

$$\text{Payloads per day} = (\text{Pallets per day consumption/pallets per PLS Payload})$$

$$\text{PLS per day} = (\text{Payloads per day}/2 \text{ Payloads(trips) per day per PLS}) \times 1.10$$

Ammunition consumption is obtained from the ammunition consumption analysis in Appendix E. Assume two trips per day per vehicle and 90% availability.

The results of this analysis are summarized in Table 2-14 below (see Figure 2-15 for graphical comparison):

TABLE 2-14

AMMUNITION TRANSPORTATION SUMMARY

	L I G H T		H E A V Y	
	NLOS	LRSM	NLOS	LRSM
PALLETS PER DAY	13	17	30	40
PALLETS PER VEH	16	20	16	20
PAYLOADS PER DAY	.081	.85	1.88	2.00
TRIPS PER DAY	2	2	2	2
PLS PER DAY	.045	.043	1.04	1.00

Ammunition transportation requirements for the LRSM are only moderately greater than for NLOS. In the light configuration, neither system requires a full additional PLS.

2.2.6 Transportability/Deployability. The transportability/deployability analysis assesses the ability of a unit and WS to accomplish intra- and inter-theater movement. Transportability is defined as the inherent capability of a WS to be moved efficiently by transportation assets and modes of transport. Deployability is the capability of a unit to be moved intra-Continental United States (CONUS), intra-theater or inter-theater to support military operations. The Transportation Engineering Agency (TEA) of the Military Traffic Management Command (MTMC) performed a transportability/deployability sub-analysis for the NLOS-CA COEA alternatives. The results of that study are summarized below. Detailed analysis is described in Appendix J.

2.2.6.1 Transportability. All systems are readily transportable by available transport assets and modes of transport, although the size and weight of the LRSM Heavy Configuration may require special routing or permits for highway transportation during intra-CONUS or intra-theater

AMMUNITION TRANSPORT REQUIREMENTS TRUCKS PER DAY PER BDE

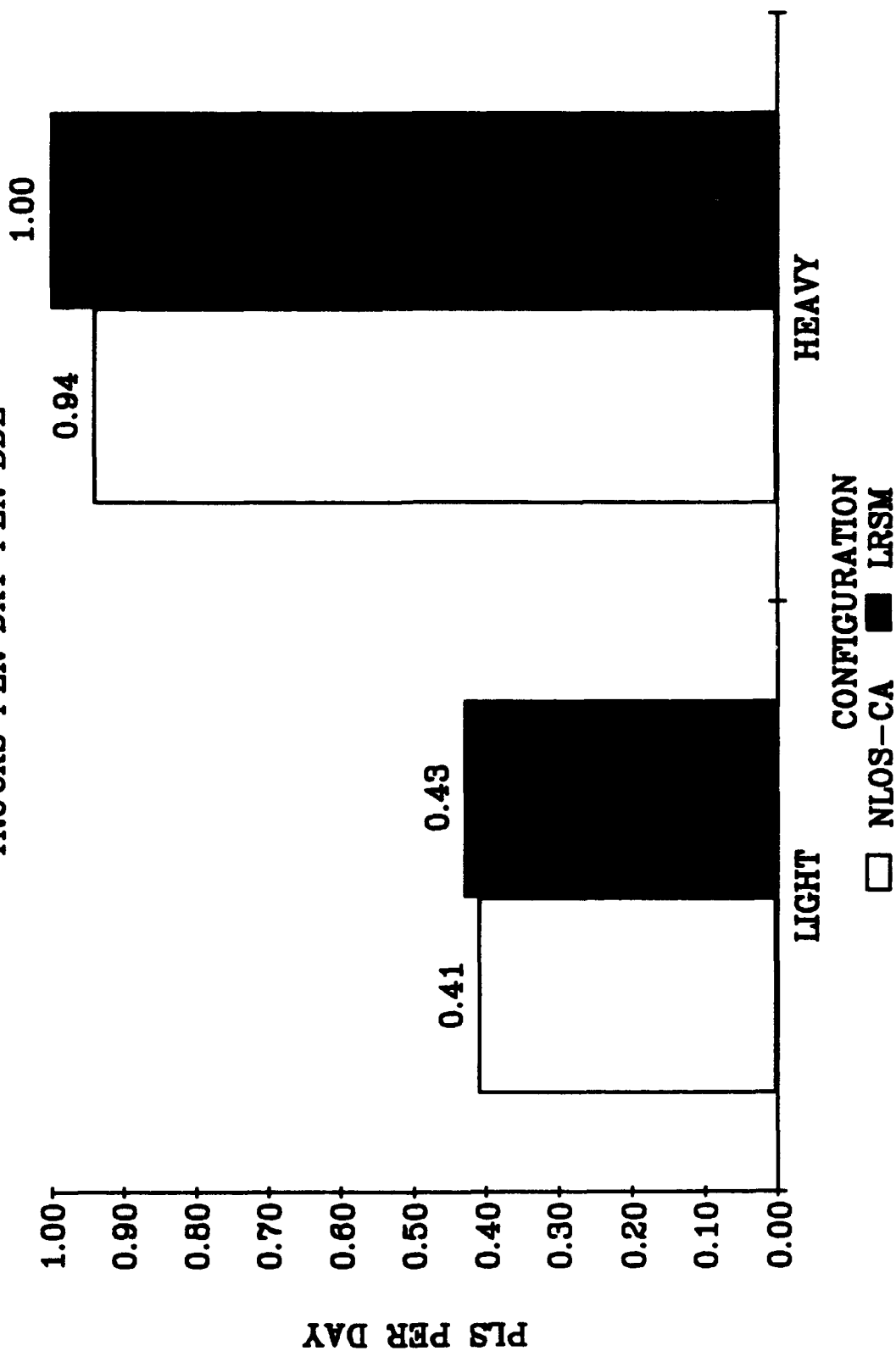


FIGURE 2-15 Ammunition Transportation Summary

road movement. The LRSM will also not be helicopter transportable for tactical movement due to size and weight limitations. Transportability values for the two configurations are summarized in Table 2-15.

TABLE 2-15
NLOS-CA TRANSPORTABILITY SUMMARY

	LIGHT		HEAVY	
	NLOS-CA	LRSM	NLOS-CA	LRSM
HIGHWAY				
CONUS	YES	YES	YES	SPECIAL ROUTING PERMITS (1)
OCONUS	YES	YES	YES	
RAIL	YES	YES	YES	YES
AIR				
C-130	YES	YES	YES	YES
C-141	YES	YES	YES	YES
C-5	YES	YES	YES	YES
ROTARY	CH-47 (2)	CH-47	CH-47	NO
SEA				
STRAT TRANSPORT	YES	YES	YES	YES
LOTS (3)	YES	YES	YES	YES
NOTES: (1) Width may require special routing for highway movement. (2) External Air Transport by CH-47 Helicopter. (3) Logistics Over the Shore (LOTS) - LARC-LX and larger lighterage vessels.				

2.2.6.2 Deployability. Both alternatives are readily deployable using available transport assets, although the light versions of both NLOS-CA and LRSM have less impact due to differences in size of the heavy LRSM WS configuration and the unit TOE. Deployability requirements are summarized in Table 2-16.

TABLE 2-16
INFANTRY BRIGADE W/NLOS-CA COMPANY
DEPLOYABILITY SUMMARY

	LIGHT		HEAVY	
	NLOS-CA	LRSM	NLOS-CA	LRSM
DEPLOYMENT TIME (1)	32 HR	32 HR	32 HR	32 HR
RAILCARS	65	66	415	416
AIR SORTIES (2)				
C-141	57	58	271	283
C-5	N/A	N/A	221	228
C-130	116	120	N/A	N/A
NOTES: (1) Air Transport: Includes loading, unloading one-way flight times with intermodal stops, Ft. Benning, GA, to Southwest Asia. (2) C-141 and C-5 sorties are strategic movement. C-130 values are for tactical movement. The Heavy Infantry Brigade is not C-130 transportable.				

2.2.7 Recoverability. Recoverability includes the consideration of the resources required to retrieve damaged and inoperable vehicles from the battle field, and between support locations. This assessment considers two dimensions of this issue:

- **Equipment.** Is existing equipment capable of performing recovery missions for the proposed WS?
- **Resources.** Are sufficient resources to meet recovery workload requirements?

Light and heavy configurations of both alternatives are constructed on the chassis of standard tactical vehicles (HMMWV and M1064). Recovery equipment and vehicles currently in the field and assigned to TOE units is capable of recovering these systems. Recovery vehicles are assigned to notional TOEs used for this study. It is therefore concluded that sufficient recovery resources are available to service the needs of organic vehicles, although the Heavy configuration of the LRSM may tax organic recovery resources due to its size, weight and tracked configuration. In summary, the logistics impact of recoverability for both alternatives is equal.

2.2.8 Explosive Ordnance Disposal (EOD). EOD support is responsible for detecting, identifying, rendering safe, evacuation, and disposal of unexploded ordnance. There are two dimensions to the logistics impact of new ordnance: (a) special process, equipment or handling requirements, and (b) unexploded ordnance volume. Special fuzing, explosives, or load (i.e., Nuclear, Biological and Chemical) are some of the design characteristics which could increase the logistics impact of new ordnance. All data received in this study indicates, that in spite of sophisticated guidance systems, fuzing and explosive loads of NLOS and LRSM rounds are conventional and will require no special handling or equipment. Render safe procedures have not been defined for these rounds and their evaluation is beyond the scope of this study.

The use of sub-munitions in anti-personnel and mine carrying munitions increases the density of unexploded ordnance on the battlefield significantly. EOD support workload and logistics impact increases accordingly when new, sub-munition carrying rounds are fielded. Neither NLOS nor LRSM will carry sub-munitions as currently defined. However, LRSM firing rate is almost two to one versus NLOS. This increased volume can be expected to increase the density of unexploded ordnance. Additionally, man-in-the loop guidance of NLOS can be expected to decrease the incidents of unexploded ordnance versus LRSM.

2.2.9 Standardization and Interoperability. Standardization and interoperability are defined in AR 700-127, Integrated Logistics Support:

A. Standardization: The process by which materiel system managers achieve maximum subsystem commonality with other WSs in the Department of the Army, other services and NATO allied nations to reduce support requirements and to attain interoperability objectives.

B. Interoperability: The ability of materiel systems, units, or forces to provide services to and accept services from other systems units or forces.

Standardization is concerned primarily with the use of common hardware systems and components to achieve support efficiencies. NLOS-CA and LRSM were assessed for the logistics impact of standardization in four subsystem categories:

- Carrier/Vehicle: All configurations of both alternatives are mounted on standard tactical/combat vehicles. Standardization of NLOS-CA and LRSM in carrier design are equal.
- Communications: All configurations of both alternatives will use standard Army SINCGARS radio communication systems. Standardization in the communications category is equal.
- System: The NLOS gunner's station and launcher are unique modules. Although there may be some use of common items at the component/subsystem level, the degree of standardization is quite low. The LRSM "system" is the standard Battalion Mortar System (BMS) 120mm mortar now being fielded light and heavy forces. The degree of standardization of the LRSM weapon is very much stronger than that of the NLOS weapon.
- Round: The NLOS missile pack includes both missile and launch canister. This subsystem is unique in design and requires special support. The LRSM will use a modified mortar round. This round has different dimensions than the standard mortar round and will require some special handling because of the guidance system. The LRSM round is much more standardized than the NLOS round due to the complexity of the missile pack.

Interoperability was assessed by the WSs ability to operate functionally within existing or planned functions.

A. Communications: Both alternatives use SINCGARS radios and are fully interoperable with existing battlefield communications systems. Communications interoperability is equal.

B. Command & Control: Both systems are interoperable with existing command and control/fire control systems. The performance

parameters and employment concept for the LRSM is not fully developed and at this points exhibits some risk in terms of doctrine employment and control. The NLOS-CA is moderately more interoperable with the command & control system than the LRSM.

C. Maintenance Support: Both systems are interoperable with the existing maintenance support system. The LRSM is somewhat more interoperable because the mortar and carrier are identical with companion systems. Although the NLOS is supportable by existing DS resources, it will require unique expertise and test program set (TPS) support for the TMDE. Both alternatives are equally interoperable in the maintenance area.

D. Supply Support: Both systems are interoperable with the existing supply systems. The LRSM is somewhat more attractive because the NLOS requires handling and delivery of non-standard missile packs throughout the area of operations. The LRSM is moderately more interoperable than the NLOS-CA.

E. Summary: The logistics impact of standardization and interoperability of the NLOS-CA is moderately greater than the impact of the LRSM.

NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)

MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)

CHAPTER 3

3.0 MANPOWER AND PERSONNEL ANALYSIS. The manpower and personnel analysis (MPA) addressed the system specific and the supporting items of equipment to determine the manpower requirements for the NLOS-CA Fiber Optic Guided Missile (FOG-M) and the alternative Long Range Smart Mortar (LRSM) systems in Heavy and Light Division configurations. This analysis included the verification of system specific operator and maintainer MOSs. The analysis began with an extensive data collection effort, obtaining the required Tables of Organization and Equipment (TOEs), associated Basis of Issue Plans (BOIPs), maintenance data for all system specific and supporting items of equipment, daily fuel and ammunition consumption rates, bulk and weight data for ammunition resupply and capacity of ammunition transport equipment. The next step in the analysis was to examine the accumulated data to determine the identity and densities of the system specific and supporting items of equipment for each of the alternatives. Once the equipment was identified and the densities determined for each alternative, the Maintenance Ratios/Annual Maintenance Man-Hours and the equipment usage rates by MOS and by maintenance level (Organizational, Intermediate Direct Support (IDS) and Intermediate General Support (IGS)), these data were then loaded into the Manpower Requirements Determination (MRD) model. It should be noted that Depot level maintenance is outside the scope of this analysis.

Through the application of standard army manpower algorithms (AR 570-2), the annual available MOS productive man-hours (AAMPM), and the Standard of Grade Authorizations (SGA) (AR 611-201) the workload driven manpower requirements by MOS, grade, and maintenance level were determined. The crew/operator manpower requirements as provided by the Army were then incorporated into the MRD model as well as the manpower required for fuel, and ammunition resupply. The results of this analysis is displayed at MOS and grade level of detail for each of the alternatives in whole man numbers for the NLOS-CA Company, and in fractional numbers for the supporting IDS and IGS activities.

3.1 GENERAL. The purpose of the NLOS-CA Manpower and Personnel analysis was to identify, using the best available data, the manpower requirements for one Brigade level NLOS-CA Company for each of the following alternatives and configurations:

NLOS-CA COMPANY HEAVY DIVISION Fiber Optic Guided Missile

NLOS-CA COMPANY LIGHT DIVISION Fiber Optic Guided Missile

NLOS-CA COMPANY HEAVY DIVISION 120mm Mortar

NLOS-CA COMPANY LIGHT DIVISION 120mm Mortar

(All systems to be mounted/transported on HMMWV except the 120mm mortar heavy division, which is mounted on a M1064 Mortar Carrier (M113 Series Tracked vehicle.) The manpower requirements for the IDS and IGS maintenance units and assess the impact of each of the alternative on the Army. Since there is no predecessor system the entire manpower and equipment requirements for the NLOS-CA Company will be an increased burden upon the Army's resource pool.

3.1.1 Scope. Provide manpower and personnel requirements estimates for the operation and maintenance of a Brigade level NLOS-CA Company, and for the supporting IDS and IGS Companies.

3.1.2 Objective. The objective of the NLOS-CA Manpower and Personnel Requirements Analysis was to identify, using the best available data, the manpower requirements by (MOS) and grade for each of the two alternatives, requested by the COEA Study, and the supporting IDS maintenance company. The manpower and personnel analysis addressed the system specific and all support military manpower requirements by grade and MOS for the alternatives described above. This analysis included verification of system specific operator and maintainer MOSs. The sources of information for determining the MOSs impacted by this MP analysis included the NLOS-CA SMMP, and other documents listed in Appendix B, and AR 611-201, Enlisted Career Management Fields and Military Occupational Specialties. The next step was to apply the BOIPs to the appropriate TOEs to determine the identity and density of all TOE equipment requirements, and to determine the appropriate operator/maintainer identities (i.e., MOS) for each of the alternatives. Once the equipment requirements were identified for each of the alternatives, the Annual Maintenance Man-Hours (AMMHs) were determined by MOS and by maintenance level for each item of equipment. This data was then loaded into the MRD Model to be used in the calculation of manpower requirements.

Organizational fuel and ammunition transport vehicle operator requirements were determined by application of the daily fuel consumption rates (e.g., gallons per hour, kilometers per gallon, etc.) by type fuel (e.g., diesel, gasoline), daily ammunition consumption rates, daily tonnage, and vehicle capacity (bulk out or weight out). The maintainer manpower requirements were then calculated for each item of equipment using the standard Army manpower determination algorithms and the revised Manpower Requirements Criteria (MARC) MOS Availability Factors contained in AR 570-2 dated 15 May 1992. SGAs from AR 611-201 for each MOS addressed were loaded into the MRD model and the distribution of manpower by grade for each MOS was calculated. The MRD model reports depict the

manpower requirements by MOS and grade, by component for each of the alternatives, the IDS and the IGS unit.

3.1.3 Manpower Analysis Assumptions and Constraints. The following assumptions and constraints were applied to the manpower and personnel analysis:

- NLOS-CA specific equipment was designed for a Two-Level Maintenance Concept. All other unit equipment was anticipated to be operated under the current U.S. Army maintenance concept.
- LRSM maintenance support concept is the standard four level maintenance system.
- BIT/BITE for NLOS-CA systems is planned to be 80% accurate, 95% of the time.
- Supply operations will continue under the current three-level concept.
- Manpower requirements were calculated for a wartime 100% manning level.

3.1.4 Personnel Assumptions and Constraints.

- For the purposes of this study, the NLOS-CA Operator MOS was designated as MOS 11C for LRSM and 11H for FOG-M.
- 11C and 11H MOS Target Audience Description were used for NLOS-CA LRSM and FOG-M physical and mental attributes.
- The quality and skill of the target audience will not increase over that of the 11C and 11H MOS.
- Manpower requirements will be supported consistent with current authorizations and operating strength levels of support.

3.1.5 MP Planning Factors Database. This database contains the information necessary to conduct the MPA and LIA requirements analysis. Most of the input data were in hard copy format. The necessary data elements had to be manually entered into the Manpower and Personnel databases by the analysts.

3.2 FINDINGS. The manpower and personnel requirements reports for each of the alternatives provide Qualitative and Quantitative MOS and Grade level of detail, listings of equipment quantities in Line Item Number (LIN) sequence, and a display of the applicable operator MOS in each organizational functional area.

3.2.1 System Manpower Requirements (See Tables H-1 through H-16 in Appendix H). The results for each alternative are displayed in recapitulation format with appropriate header information:

UNIT MANPOWER REQUIREMENTS

MOS	DTOE	PROJECTED	DELTA	NLOS CO	GRADE
	NLOS CO	NLOS CO			

EQUIPMENT SECTION
NLOS CO _____

LIN	NOMENCLATURE	NEW REQ
-----	--------------	---------

3.2.2 Base Case - Zero. The manpower requirements identified for the Base Case system were nonexistent since the base case is zero. This situation indicates that there are no "bill payers" available to fund manpower requirements for either of the alternatives.

3.2.3 NLOS-CA FOG-M Heavy Division Manpower Results (see Table 3-1). The NLOS-CA Company (FOG-M) Heavy Division system operator/crewmember were determined by the Army to be two (2) per system. Maintainer manpower requirements for system specific and supporting items of equipment were calculated using the maintenance ratios or AMMHs provided by the NLOS-CA PMO or extracted from the Army MARC Maintenance Database (AMMDB).

TABLE 3-1

NLOS-CA FOG-M HEAVY DIVISION MANPOWER RESULTS (Distribution of 11H Heavy Antiarmor Weapons Infantrymen)

PARA NO.	FUNCTIONAL AREA	E-8	E-7	E-6	E-5	E-4	E-3	TOTAL
101	HQ SECTION	1	1	1		2		5
104	PLAT HQ		3				9	12
105	NLOS SECTION			6	6	12		24
	TOTAL	1	4	7	6	14	9	41
OFFICER		WARRANT		ENLISTED		TOTAL		
5		0		56		61		

3.2.4 NLOS-CA FOG-M Light Division Manpower Results (see Table 3-2). The NLOS-CA Company (FOG-M) Light Division system operator/crewmember were determined by the Army to be two (2) per system. Maintainer manpower requirements for system specific and supporting items of equipment were calculated using the maintenance ratios or AMMHs provided by the NLOS-CA PMO or extracted from the AMMDB.

TABLE 3-2

NLOS-CA FOG-M LIGHT DIVISION MANPOWER RESULTS
(Distribution of 11H Heavy Antiarmor Weapons Infantrymen)

PARA NO.	FUNCTIONAL AREA	E-8	E-7	E-6	E-5	E-4	E-3	TOTAL
101	HQ SECTION	1	1	1		2		5
104	PLAT HQ		3				9	12
105	NLOS SECTION			6	6	12		24
	TOTAL	1	4	7	6	14	9	41
OFFICER		WARRANT		ENLISTED		TOTAL		
5		0		55		60		

3.2.5 LRSM Heavy Division Manpower Results (see Table 3-3). The manpower requirements for the LRSM Heavy Division system operator/crewmember were determined by the Army to be five (5) per system. Maintainer manpower requirements for system specific and supporting items of equipment were calculated using the maintenance ratios or AMMHs provided by the NLOS-CA PMO or extracted from the AMMDB.

TABLE 3-3

LRSM HEAVY DIVISION MANPOWER RESULTS
(Distribution of 11C Indirect Fire Infantrymen)

PARA NO.	FUNCTIONAL AREA	E-8	E-7	E-6	E-5	E-4	E-3	TOTAL
101	HQ SECTION	1					2	3
103	PLAT HQ	2					2	4
104	MORTAR SECTION		4	4	4		4	16
105	MORTAR SQUAD				12	24	24	60
	TOTAL	3	4	4	16	24	32	83
OFFICER		WARRANT		ENLISTED		TOTAL		
5		0		107		112		

3.2.6 LRSM Light Division Manpower Results (see Table 3-4). The manpower requirements for the LRSM Light Division system operator/crewmember were determined by the army to be five (5) per system. Maintainer manpower requirements for system specific and supporting items of equipment were calculated using the maintenance ratios or AMMHs provided by the NLOS-CA PMO or extracted from the AMMDB.

TABLE 3-4

LRSB LIGHT DIVISION MANPOWER RESULTS
(Distribution of 11C Indirect Fire Infantrymen)

PARA NO.	FUNCTIONAL AREA	E-8	E-7	E-6	E-5	E-4	E-3	TOTAL
101	HQ SECTION	1					2	3
103	PLAT HQ	2					2	4
104	MORTAR SECTION		4	4	4		4	16
105	MORTAR SQUAD				12	24	24	60
	TOTAL	3	4	4	16	24	32	83
OFFICER		WARRANT		ENLISTED		TOTAL		
5		0		99		104		

3.2.7 Intermediate Direct Support (IDS) and Intermediate General Support (IGS) Maintenance Manpower. The format for the IDS analysis differs from that of the NLOS-CA CO. Columns A and B display only the MOSC and the fractional manpower requirements for the system specific and supporting equipment items. This demand would be added to the existing demands of the supporting units. See Table H-14 in Appendix H for IDS and IGS manpower results.

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX A
LIST OF ACRONYMS**

AAMPM	Annual Available MOS Productive Man-Hours
ADDS	Army Digital Data System
AHP	Analytical Hierarchy Process
AMMH	Annual Maintenance Man Hours
AEPCO	Advanced Engineering and Planning Corp.
AOE	Army of Excellence
APGMM	Advanced Precision Guided Mortar Munitions
ASARC	Army Systems Acquisition Review Council
ARDEC	Army Research Development and Engineering Center
ASVAB	Armed Services Vocational Aptitude Battery
ASI	Additional Skill Identifier
ATE	Automatic Test Equipment
A _o	Operational Availability
BCE	Baseline Cost Estimate
BCS	Baseline Comparison System
BFA	Battlefield Functional Area
BIT/BITE	Built-in Test/Built-in Test Equipment
BMS	Battalion Mortar System
BOIP	Basis of Issue Plan
BRU	Battery Replaceable Unit
BSTF	Base Shop Test Facility
CARD	Cost Analysis Requirements Document
C ²	Command and Control
CDR	Critical Design Review
CHS	Common Hardware and Software
CLS	Contractor Logistic Support
COEA	Cost and Operational Effectiveness Analysis
CSS	Combat Service Support
CTS	Contact Test Set
DA	Department of the Army
DCD	Directorate of Combat Developments
DEM/VAL	Demonstration and Validation
DNAW	Day/Night and Adverse Weather
DoD	Department of Defense
DPAMMH	Direct Productive Annual Maintenance Man Hours
DRC	Dynamics Research Corporation
DS	Direct Support
EMD	Engineering and Manufacturing Development
EOD	Explosive Ordnance Disposal

FO	Force Operations
FOG-M	Fiber Optic Guided Missile
FSD	Full Scale Development
FU	Fire Unit
FY	Fiscal Year
GC	Gunner's Console
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GS	General Support
HARDMAN	Hardware versus Manpower
HCM	HARDMAN Comparative Methodology
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HSI	Human Systems Integration
HHV	Heavy Version, HMMWV
IFTE	Integrated Family of Test Equipment
IDS	Intermediate Direct Support
ILS	Integrated Logistic Support
ILSP	Integrated Logistic Support Plan
LIA	Logisitics Impact Analysis
LNS	Land Navigation System
L/SC	Launch/Storage Container
LRIP	Low Rate Initial Production
LRSM	Long Range Smart Mortar
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
LSAR	Logistics Support Analysis Record
MAC	Maintenance Allocation Chart
MANPRINT	Manpower and Personnel Integration
MARC	Manpower Requirements Criteria
MATDEV	Materiel Developer
MDR	Milestone Decision Review
MER	Manpower Estimate Report
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOPP	Mission Oriented Protective Posture
MOS	Military Occupational Specialty
MPA	Manpower and Personnel Analysis
MPT	Manpower, Personnel, and Training
MR	Maintenance Ratio
MRD	Manpower Requirements Determination
MTBF	Mean Time Between Failure
MTBOMF	Mean Time Between Operational Mission Failure
MTBUMA	Mean Time Between Unscheduled Maintenance Actions
MTOE	Modified Table of Organization and Equipment
MTTR	Mean Time to Repair
NBC	Nuclear, Biological, and Chemical

NETP New Equipment Training Plan

OMS Operator, Maintainer, Support

OMS/MP Operational Mode Summary/Mission Profile

O&M Operator and Maintainer

O&O Operational and Organizational

ORD Operational Requirements Document

OVE On Vehicle Equipment

PHS Packaging, Handling and Storage

PLL Prescribed Load List

PLS Palletized Load System

PM Program Manager

PMCS Preventive Maintenance Checks and Services

PMO Project Manager's Office

PTL Primary Target Lines

QQPRI Qualitative and Quantitative Personnel Requirements
Information

RAM Reliability, Availability, and Maintainability

RDEC Research, Development and Engineering Center

RRR RAM Rationale Report

SGA Standard of Grade Authorizations

SINCGARS Single Channel Ground and Airborne Radio System

SME Subject Matter Expert

SMMP System MANPRINT Management Plan

SRC Standard Requirements Code

SRU Shop Repairable Unit

STRAP System Training Plan

TAD Target Audience Description

TDA Table of Distribution and Allowances

TMDE Test, Measurement and Diagnostic Equipment

TOC Tactical Operations Center

TOE Table of Organization and Equipment

TPS Test Program Set

TRAC TRADOC Analysis Center

TRADOC Training and Doctrine Command

USAADASCH United States Army Air Defense Artillery Center and School

USAIS United States Army Infantry School

USAMICOM United States Army Missile Command

USAMSAA United States Army Materiel Systems Analysis Activity

USAOC&S United States Army Ordnance Center and School

USAOMMCS United States Army Ordnance, Missile, and Munitions Center
and School

URS Unit Reference Sheet

WS Weapon System

WSMR White Sands Missile Range, New Mexico

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX B
REFERENCES**

The following documents, reports, and training publications have been reviewed and used as references as part of the NLOS-CA MPA and LIA:

- Operational Mode Summary/Mission Profile for NLOS-CA, 7 February 1992, U.S. Army Infantry School (USAIS), Fort Benning, Georgia (SECRET)
- Operational Requirements Document (ORD) for NLOS-CA System, 11 June 1993, USAIS, Directorate of Combat Developments (DCD), Fort Benning, Georgia (Secret)
- NLOS-CA System Specification, 22 June 1993, NLOS-CA PMO, Huntsville, Alabama (Secret)
- Draft NLOS-CA System MANPRINT Management Plan (SMMP), 9 June 1993, USAIS-DCD, Fort Benning, Georgia
- NLOS-CA System Training Plan (STRAP), 6 May 1993, USAIS, Directorate of Training Development (DOTD), Fort Benning, Georgia
- NLOS-CA Qualitative and Quantitative Personnel Requirements Information (QQPRI), 19 March 1993, NLOS-CA Project Manager's Office (PMO), Huntsville, Alabama
- NLOS-CA Table of Organization and Equipment (TOE), 31 July 1993, USAIS-DCD, Fort Benning, Georgia
- NLOS-CA , Operational and Organizational Plan, 16 August 1991, NLOS-CA PMO, Huntsville, Alabama
- NLOS-CA Test and Evaluation Master Plan, 17 June 1993, NLOS-CA PMO, Huntsville, Alabama
- Draft NLOS-CA Integrated Logistics Support Plan, July 1993, NLOS-CA PMO, Huntsville, Alabama

- Non-Line of Sight (NLOS) Air Defense/Anti-Tank (AD/AT) HARDMAN Study, February 1990, Hay Systems Inc., Washington, DC.
- Final Draft Material Fielding Plan for M120 120mm Towed Mortar, January 1991, U.S. Army Armament, Munitions, and Chemical Command, Rock Island Arsenal, Illinois
- Final Draft, Integrated Logistic Support Plan for the 120MM Mortar Enhanced Ammunition, 25 February 1991, U.S. Army Armament, Munitions and Chemical Command, Picatinny Arsenal, NJ
- Non-Line of Sight-Combined Arms (NLOS-CA) Manpower Estimate Report (MER), October 1993, NLOS-CA Project Management Office, AMSMI-NL, Redstone Arsenal, Alabama 35898-5793

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX C
MISSION PROFILE ANALYSIS**

C-1 General: The operating metrics system operating miles, system operating hours, and rounds fired are basic inputs to the calculation of several Measures of Performance (MOP) used in the Logistics Impact Analysis of the NLOS-CA and LRSM weapon systems. This describes the methodology used to derive those values.

C-2 Reference: NLOS-CA Operational Requirements Document, Annex B, dated 11 June 1993, Unclassified data only was the source document for this analysis. The LRSM is a notional system at the time of this analysis and no Operational Mode Summary/Mission Profile is available. Therefore, in accordance with guidance provided by PM Mortar through the COEA Study Team, the NLOS-CA Mission Profile was applied to the LRSM.

C-3 Methodology: Task times and number of occurrences were extracted from Mission Profiles tables in the OMS/MP. Mission Tasks were allocated to the appropriate operating metrics and totalled to calculate the following variables:

- a. Travel - miles and hours on chassis.
- b. Weapon system operational time - operating time on weapon system.
- c. Assume radios operate during entire operational period (travel, ready, alert and operational).
- d. "Number of occurrences" of the "Fire Missile" task equals rounds fired.

When necessary, raw data extracted from the Mission Profile was converted to the appropriate measure, i.e kilometers per hour to miles per hour.

C-4 Assumptions and Constraints:

- a. The 96 hour combat scenario described in the OMS/MPG is appropriate and applicable.
- b. Valid daily rates can be obtained by dividing scenario rates by four.

c. The mission profile of the LRSM is identical to the NLOS-CA.

C-5 Analysis:

a. General: The Operational Mode Summary/Mission Profile describes how a weapon will be employed during performance of its mission. The Mission Profile is a time-phased description of the operational events and environments a weapon system experiences from beginning to end of a specific mission. It identifies tasks, events, durations, operating conditions and environment of the system for each phase of a given mission.

Five missions are described for the NLOS-CA:

- (1) Covering Force.
- (2) Main Battle Area (MBA) Defense
- (3) Attack
- (4) Counterattack
- (5) Reserve

Heavy units perform all missions. Light units are assigned only MBA defense, attack, and reserve missions.

b. Operating Hours- NLOS-CA: The NLOS Mission Profile is measured in operating hours. Relevant data is summarized in Table C-1 for both heavy and light units.

Time segment used in the analysis are summarized as follows:

(1) Travel Time is that Segment of Ready Operational Time, designated Ready-Travel in the MP, during which the system is moving between locations. Emplacement time is included in travel time for this analysis.

(2) Weapon Operating Time is that portion of Ready Operational Time, designated Weapon System Operational Time, during which the weapon system is powered up.

(3) Alert Time is that time during which radios are operating, but the system is not powered up. For this analysis, Alert Time is the sum of Ready Alert and non-Ready Operational Alert Time segments.

Note that total time does not add up to 96 hours. System down time is not calculated.

TABLE C-1

**MISSION PROFILE OPERATING HOURS PER NLOS-CA FIRING UNIT
96 HOUR SCENARIO**

HEAVY BRIGADE NLOS SUMMARY			
MISSION	TRAVEL TIME	WPN OP TIME	ALERT TIME
COVER FORCE	3.5	4.5	12.1
MBA DEFENSE	9.1	6.4	7.2
ATTACK	1.6	1.5	20.2
COUNTERATTACK	4.4	2.4	5.2
RESERVE	.8	0	8.5
T O T A L	19.4	14.8	53.2
LIGHT BRIGADE NLOS SUMMARY			
MISSION	TRAVEL TIME	WPN OP TIME	ALERT TIME
MBA DEFENSE	4.7	6.6	60.9
ATTACK	1.1	.8	1.2
RESERVE	.8	0	1.1
T O T A L	6.6	7.4	63.2
NOTES: 1. Travel Time includes emplacement time 2. Alert Time = Ready Alert + Alert Time (AT) 3. All times in hours			
SOURCE: NLOS-CA ORD, OMS/MPG, dated 11 June 1993, unclassified data only. Tables A-4 through A-12.			

c. Operating Miles: Miles travelled is calculated by determining the time spent traveling in each terrain type and converting to miles using average speed.

The number and duration of trips by primary roads, secondary roads and cross country was extracted from the Mission Profile to obtain total travel time per terrain. Average speed per terrain was extracted from Table A-2, page B-2 in Kilometers per hour (KPH):

Travel time * kph= kilometers

Kilometers travelled was then converted to miles by multiplying by .6214.

Miles travelled in each terrain type by mission were summed to obtain total miles travelled.

A summary of operating miles per scenario is displayed in Table C-2.

TABLE C-2

**MISSION PROFILE OPERATING MILES PER NLOS-CA FIRING UNIT
96 HOUR SCENARIO**

HEAVY BRIGADE NLOS SUMMARY				
MISSION	PRIMARY	SECONDARY	CROSS COUNTRY	TOTAL
COVER FORCE	4.66	2.80	13.26	20.71
MBA DEFENSE	10.36	68.35	28.34	107.05
ATTACK	0.00	7.46	5.80	13.26
COUNTERATTACK	0.00	37.38	14.42	51.70
RESERVE	0.00	11.19	0.83	12.01
T O T A L	15.02	127.08	62.64	204.73
LIGHT BRIGADE NLOS SUMMARY				
MISSION	PRIMARY	SECONDARY	CROSS COUNTRY	TOTAL
MBA DEFENSE	10.36	68.35	28.34	107.05
ATTACK	0.00	7.46	5.80	13.26
RESERVE	0.00	11.19	0.83	12.01
T O T A L	15.02	127.08	62.64	204.73
SOURCE: NLOS-CA ORD, OMS/MPG, dated 11 June 1993, unclassified data only. Tables A-2, A-4 through A-12.				

d. **Rounds Fired:** The number of missiles fired per mission per 96 hour scenario are provided in Mission Profile Tables. NLOS-CA "Missiles Fired" are converted to LRSM rounds fired using a factor based on Pk(e).

$$Pk(e)NLOS-CA = P(\text{launch}) * P(\text{kill}) = .9 * .9 = .8$$

Assume Pk(e) LRSM round = .4 based on guidance from USAIS and COEA team.

$$\text{Conversion factor} = .8 / .4 = 2$$

A summary of NLOS missiles and LRSM rounds fired is displayed in Table C-3. A summary of Mission Profile/Operating Metric results is displayed in Table C-4.

TABLE C-3

**MISSION PROFILE ROUNDS FIRED PER NLOS-CA AND LRSM FIRING UNIT
96 HOUR SCENARIO**

HEAVY BRIGADE NLOS SUMMARY			
MISSION	NLOS LAUNCHERS	CONV FACTOR	EQUIV LRSM RND
COVER FORCE	12	2	24
MBA DEFENSE	30	2	60
ATTACK	7	2	14
COUNTERATTACK	10	2	20
RESERVE	0	2	0
T O T A L	59	2	118
LIGHT BRIGADE NLOS SUMMARY			
MISSION	NLOS LAUNCHERS	CONV FACTOR	EQUIV LRSM RND
MBA DEFENSE	18	2	36
ATTACK	7	2	14
RESERVE	0	2	0
T O T A L	25	2	50
SOURCE: NLOS-CA ORD, OMS/MPG, dated 11 June 1993, unclassified data only. Tables A-4 through A-12.			

TABLE C-4

**OPERATING METRIC SUMMARY PER WEAPON SYSTEM
96 HOUR SCENARIO**

	H E A V Y		L I G H T	
	NLOS	LRSM	NLOS	LRSM
TRAVEL TIME (HRS)	19.4	N/A	6.6	N/A
OPERATING MILES	204.73	204.73	60.71	60.71
WPN OP TIME (HRS)	14.8	14.8	7.4	7.4
ALERT TIME	53.2	53.2	63.2	63.2
ROUNDS FIRED	59	118	25	50

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX D
FUEL CONSUMPTION ANALYSIS**

D-1 General. Fuel consumption is a function of fuel consumption rates and miles driven for each system.

D-2 References. A complete set of fuel consumption rates for equipment included in this study was not available from the U.S. Army Petroleum Center. Fuel Consumption Rates were obtained from FM 10-13, Supply and Service Reference Data. The Methodology for this analysis was obtained from FM 101-10-1, Staff Officer's Field Manual; Organizational, Technical and Logistic Data.

D-3 Methodology. Usage rates (mileage) were derived for each weapon system from an analysis of the OMS/MP (see Appendix C, Mission Profile Analysis to this report). Mileage is the sum of road miles, cross country, miles and service miles.

- Road miles are travel on primary and secondary roads. Fuel consumption in this environment is at the rated value.
- Cross country miles are travelled off-road in rugged terrain. Fuel consumption in cross country environments is 1.5 times the average rate.
- Service usage represent vehicle operation for warm-up, administration, reconnaissance and movement within the bivouac area. Service fuel consumption is estimated as equal to fuel required to move all vehicles the equivalent of 16 road kilometers.

Daily consumption per vehicle was multiplied by vehicle quantities per unit to obtain gallons per day consumption per unit. A wastage factor of 10% of the total usage was added to obtain total fuel consumption per unit.

Due to differences in Mission Profile for Light and Heavy scenarios, fuel consumption was calculated for equipment in both scenarios. Equipment lines were extracted to create aggregate unit values provided in the report.

D-4 Assumptions and Constraints.

- All equipment uses diesel fuel.

D-5 Analysis.

Fuel Consumption calculations are summarized in Tables D-1 through D-5.

TABLE D-1

HEAVY SCENARIO FUEL (DIESEL) CONSUMPTION CALCULATIONS SUMMARY

	ROAD MFD	X CNTRY MFD	SERVICE MFD	GAL PER MILE	GPD PER VEHICLE	WASTAGE	TOT GPD PER VEH
C10990 CARRIER, 120mm	35.58	15.6	9.94	0.40	27.68	2.77	30.45
C18234 CARRIER, FULL TR	35.58	15.6	9.94	0.40	27.68	2.77	30.45
D11538 CARRIER, CMD PO	35.58	15.6	9.94	0.40	27.68	2.77	30.45
G11966 GEN SET SKW	24	---	---	1.40	33.60	3.36	36.96
G18358 GEN 3KW SKID	24	---	---	1.40	33.60	3.36	36.96
T39518 TRK, CGO, 8X8 HEM	66.48	26.59	9.94	0.20	23.59	2.36	25.95
T61494 TRK, UTIL HMMWV	35.58	15.6	9.94	0.09	6.20	0.62	6.82
T63083 TRK, WRK, 8x8	66.48	26.59	9.94	0.20	23.59	2.36	25.95
T87243 TRK, FL 2500 GAL	66.48	26.59	9.94	0.20	23.59	2.36	25.95
T92242 TRK, UTIL HMMWV	35.58	15.6	9.94	0.09	6.20	0.62	6.82
Z28175 FOG-M SYSTEM	35.58	15.6	9.94	0.09	6.20	0.62	6.82
Z40430 TRK, CGO LMTV	35.58	15.6	9.94	0.09	6.20	0.62	6.82
Z62381 RECOV M88A1E1	35.58	15.6	9.94	0.68	45.57	4.66	51.22
Z94097 TRK, TNK POL MTV	66.48	26.59	9.94	0.20	23.59	2.36	25.95
Z94433 TRK, WRKR MTV	66.48	26.59	9.94	0.20	23.59	2.36	25.95

TABLE D-2

LIGHT SCENARIO FUEL CONSUMPTION CALCULATIONS SUMMARY

NOMENCLATURE	ROAD MPD	X CNTRY MPD	SERVICE MPD	GAL PER MILE	GPD PER VEHICLE	WASTAGE	TOT GPD PER VEH
G18358 GEN 3KW SKID	24	...	...	1.40	33.60	3.36	36.96
T07679 TRK, UTIL HHV	19.12	7.65	9.94	0.20	8.22	0.82	9.04
T39518 TRK, CGO, 8X8 HEM	19.12	7.65	9.94	0.20	8.22	0.82	9.04
T61494 TRK, UTIL HMMWV	19.12	7.65	9.94	0.09	3.65	0.36	4.01
T63093 TRK, WRKR 8X8	19.12	7.65	9.94	0.20	8.22	0.82	9.04
T87243 TRK, FL 2500 GAL	8.46	3.58	9.94	0.20	4.92	0.49	5.42
Z94097 TRK, TNK POL MTV	19.12	7.65	9.94	0.20	8.22	0.82	9.04
Z40430 TRK, CGO LMTV	19.12	7.65	9.94	0.09	3.65	0.36	4.01
Z94433 TRK, WRKR MTV	19.12	7.65	9.94	0.20	8.22	0.82	9.04
Z94491 TRK, HHV 1097	10.47	4.19	9.94	0.20	5.34	0.53	5.87
Z28175 FOG-M SYSTEM	10.47	4.19	9.94	0.09	2.40	0.24	2.64

TABLE D-3

**FUEL CONSUMPTION SUMMARY BY UNIT
(GALLONS - DIESEL)**

N L O S / L R S M L I G H T			
NOMENCLATURE	VEH QTY	TOTAL GPD PER VEH	TOTAL GPD PER UNIT
G18358 GEN 3KW SK	1	36.96	36.96
T07679 TRK, UTIL H	12	9.04	108.48
T39518 TRK, CGO 8X	3	4.01	12.03
T61494 TRK, UTIL H	5	4.01	20.05
T63093 TRK, WRLR 8	1	9.04	9.04
T87243 TRK, FL 250	1	5.42	5.42
T40430 TRK, CGO LM	1	4.01	4.01
Z94097 TRK, TNK PO	1	9.04	9.04
Z94433 TRK, WRKR M	1	9.04	9.04
Z28175 FOG-M SYS	12	2.64	31.68
TOTAL			245.75

TABLE D-4

**FUEL CONSUMPTION SUMMARY BY UNIT
(GALLONS - DIESEL)**

N L O S H E A V Y			
NOMENCLATURE	VEH QTY	TOTAL GPD PER VEH	TOTAL GPD PER UNIT
G18358 GEN 3KW SK	1	36.96	36.96
T39518 TRK, CGO 8X	3	25.95	77.85
T61494 TRK, UTIL H	5	6.82	34.10
T63093 TRK, WRLR 8	1	28.54	28.54
T87243 TRK, FL 250	1	25.95	25.95
T92242 TRK, UTIL H	12	6.82	81.84
Z94433 TRK, WRKR M	1	15.38	15.38
Z28175 FOG-M SYS	12	15.38	184.56
TOTAL			485.18

TABLE D-5

**FUEL CONSUMPTION SUMMARY BY UNIT
(GALLONS - DIESEL)**

L R S M H E A V Y			
NOMENCLATURE	VEH QTY	TOTAL GPD PER VEH	TOTAL GPD PER UNIT
C10990 CARRIER, 12	12	30.45	365.40
C18234 CARRIER, FU	4	30.45	121.80
D11538 CARRIER, CM	1	30.45	30.45
G11966 GEN SET 5K	1	36.96	36.96
G18358 GEN 3KW SK	1	36.96	36.96
T39518 TRK, CGO 8X	3	25.95	77.85
T61494 TRK, UTIL H	4	6.82	27.28
T63093 TRK, WRKR 8	1	25.95	25.95
T87243 TRK, FL 250	1	25.95	25.95
Z62381 RECOV M88A	1	51.22	51.22
Z94097 TNK, TNK PO	1	25.95	25.95
Z94433 TRK, WRKR M	1	25.95	25.95
TOTAL			851.72

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX E
AMMUNITION CONSUMPTION ANALYSIS**

E-1 General. Ammunition consumption was calculated from firing rates documented in the OMS/MP.

E-2 References. Firing rates were obtained from NLOS-CA the Operational Requirements Document, Annex B, dated 11 June 1993. The methodology used to extract these rates is detailed in Appendix C, Mission Profile Analysis to this report. Ammunition rates, volumes and shipping configuration data was provided and certified by the NLOS-CA and Mortar Program Management Offices.

E-3 Methodology. Ammunition consumption per weapon system per 96 hour scenario was calculated from the NLOS-CA Mission Profile. Consumptions by rounds was converted to pallets by dividing total rounds by rounds per pallet. Fractional pallet quantities were rounded up to the next whole pallet. Weight and volume cube were then calculated from pallet dimensions. Unit quantities were obtained by multiplying consumption per weapon system by weapon system per unit.

E-4 Analysis. Pallet dimensions are summarized in Table E-1 for both NLOS-CA and LRSM ammunition.

**TABLE E-1
AMMUNITION PALLET DIMENSION SUMMARY**

	N L O S	L R S M	
		LIGHT	HEAVY
ROUNDS	6	9	9
LENGTH	86	43	43
WIDTH	64.5	39	39
HEIGHT	12.75	46	46
CUFT	40.9	44.6	44.6
TOTAL WEIGHT	1088.2	484	484

Consumption by weapon system was multiplied by 12 to obtain consumption by Brigade (NLOS Company). Consumption by scenario was divided by 4 to obtain daily consumption quantities. Calculations are summarized in Tables E-2 and E-3 as follows:

TABLE E-2

NLOS AMMUNITION CONSUMPTION SUMMARY

N L O S L I G H T					
		PALLETS			
	ROUNDS	(a)	(b)	TONS	CUBE
WEAPON SYSTEM					
PER SCENARIO	25	4.17	5	2.73	204.50
PER DAY	6.25	1.04	2	1.09	81.80
BRIGADE					
PER SCENARIO	300	50.00	51	27.80	2085.90
PER DAY	75	12.50	13	7.09	531.70
N L O S H E A V Y					
		PALLETS			
	ROUNDS	(a)	(b)	TONS	CUBE
WEAPON SYSTEM					
PER SCENARIO	59	9.83	10	5.45	409.00
PER DAY	14.75	2.46	3	1.64	122.7
BRIGADE					
PER SCENARIO	708	118.00	118	64.31	4826.2
PER DAY	177	29.50	30	16.35	1227

TABLE E-3

LRSM AMMUNITION CONSUMPTION SUMMARY

L R S M L I G H T					
		PALLETS			
	ROUNDS	(a)	(b)	TONS	CUBE
WEAPON SYSTEM					
PER SCENARIO	50.00	5.56	6	1.45	267.60
PER DAY	12.50	1.39	2	0.48	89.20
BRIGADE					
PER SCENARIO	600.00	66.67	67	16.21	2988.20
PER DAY	150.00	16.67	17	4.11	758.20
L R S M H E A V Y					
		PALLETS			
	ROUNDS	(a)	(b)	TONS	CUBE
WEAPON SYSTEM					
PER SCENARIO	118.00	13.11	14	3.39	624.40
PER DAY	29.50	3.28	4	0.97	178.40
BRIGADE					
PER SCENARIO	1416.00	157.33	158	38.24	7046.80
PER DAY	354.00	39.33	40	9.68	1784.00

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX F
RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAM) ANALYSIS**

F-1 General. Reliability, Availability and Maintainability (RAM) values measure the operational readiness and maintenance support required to achieve desired readiness levels. Three categories of RAM parameters were used in this study:

- **Operational Readiness parameters.** Measure the probability a system will be available when needed. Operational Availability (A_o) is the measure of merit for this category of RAM variable.
- **Mission Success.** Mission success variables measure the probability that a system will complete a mission. Mean Time Between Operational Mission Failures (MTBOMF) is used to measure this variable.
- **Maintenance Manpower.** Maintenance manpower is a function of the frequency of failure and the average time required to repair a failure. Mean Time Between Unscheduled Maintenance Actions (MTBUMA) and Mean Time To Repair (MTTR) measure these characteristics.

F-2 References and Data Sources. RAM data was provided by PM NLOS-CA and PM Mortar. The NLOS-CA System Specification, MIS 46200, dated June 1993 and the RAM Rationale Report Annex to the NLOS-CA Operational Requirements Document (ORD), dated June 1993 were the primary data sources for the NLOS-CA System. Data for the LRSM was provided by PM Mortar and is derived from acquisition and fielding documents for the 120mm Battalion Mortar System. Data was also provided by U.S. Army Tank and Automotive Command (TACOM) for the M1097 HMMWV and M1064 Mortar Carrier. Verbal certification has been provided by PM NLOS-CA and PM Mortar. Informal agreement on data sources was provided by USAMSAA. Formal certification by USAMSAA of data used in the following analysis has been requested but has not been received as of the date of this report. Data used for this analysis is engineering RAM data derived from the sources discussed above. Alternate sources for this data, including sources of operational, test-based RAM data were discussed with PM offices and USAMSAA representatives. No sources of this type were uncovered during the data collection effort. Further, given the notional status of system designs, the COEA Study Director indicated a preference for engineering data. Therefore, this data was judged to be the best

available within the scope of the effort, and was used in the analysis to assure consistency of comparisons.

F-3 Assumptions and Constraints.

a. Assumptions.

- Engineering RAM values are valid for determining logistics impact.
- 120mm BMS RAM values apply to the notional LRSM.
- Mortar maintenance is negligible.

b. Constraints.

- The LRSM is a notional system. The level of detail used in the analysis and the degree of accuracy required of the data reflects the status of this alternative.
- Stringent time constraints on the performance of this analysis precluded a more comprehensive search for data.

F-4 Methodology. Data was used as provided where the form and source of data supported this approach. MTBOMF was the only variable requiring analysis. To determine MTBOMF, the MTBOMF of LRSM Sub-systems was converted from Mean Rounds to Mean Time dependencies and combined to calculate a system MTBOMF value.

Conversion from rounds to hours was completed in order to provide a consistent basis for comparison of the two systems. The mortar is the sub-system with greatest failure dependency on rounds fired. It is also assumed to have a very low failure rate. The carrier on the other hand accounts for the bulk of system failures. Hours are a valid dependency for the carrier.

F-5 Analysis. Analysis was conducted to determine RAM for the NLOS-CA and LRSM systems and is summarized in Table F-1:

TABLE F-1

NLOS-CA LIA RAM SUMMARY

		N L O S	L R S M	
			LIGHT	HEAVY
MTBOMF		161(a)	152(b)	79.8(c)
MTBUMA		22.9(d)	26.4(e)	13.1(e)
MTTR	UL	.72	1.4(f)	N/A(h)
	DS	2.25	2.1(f)	N/A
	GS	5.5	5.5(f)	N/A
MR		.12	.13(g)	.38(g)
A ₁		.93	.97	.91

Table 1 NOTES: MTBOMF for the LRSM was calculated as follows:

a. Light Configuration:

(1) Convert MRBOMF to MTBOMF. $MTBOMF = 2150 \text{ rounds (MRBOMF)} / 62.5 \text{ rounds per 96 hr engagement} * 7.4 \text{ hours weapon system operating time per engagement.}$

(2) Calculate System MTBOMF

$MTBOMF \text{ system} = 1 / \text{SUM (Failure Rate Sub-Systems)}$

$F(R) \text{ Failure Rate} = 1 / MTBOMF,$

$F(r) \text{ carrier} = .0027,$

$F(r) \text{ mortar} = .0039;$

$MTBOMF \text{ system} = 1 / (.0027 + .0039) = 152$

b. Heavy Configuration:

(1) Convert MRBOMF to MTBOMF. $MTBOMF (Hvy) = 2680 \text{ rounds (MRBOMF)} / 147 \text{ rounds per 96 hr engagement} * 14.8 \text{ hours weapon system operating time per engagement.}$

(2) Calculate System MTBOMF

$MTBOMF \text{ system} = 1 / \text{SUM (Failure Rate Sub-Systems)}$

$F(R)$ Failure Rate = $1/MTBOMF$,

$F(r)$ carrier = .0088,

$F(r)$ mortar = .0037;

c. $MTBOMF$ system = $1/ (.0088+.0037) = 79.8$

d. System $MTBUMA$

e. Carrier $MTBUMA$. Mortar maintenance is negligible.

f. Carrier $MTTR$. Mortar maintenance is negligible.

g. Carrier MR . Mortar maintenance is negligible.

h. Mortar $MTTR$ is negligible. Carrier $MTTR$ was not available.

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX G
ANALYTICAL HIERARCHY PROCESS ANALYSIS**

G-1 Introduction. The objective of this analysis was "to determine the logistics impact of fielding the NLOS-CA system." This required the assessment and comparison of two alternative designs across 46 hierarchical criteria: six (6) EEA, nine (9) sub-analyses, and 31 MOP/MOEs. Cassady and Goodwin (May 1992) have described several operational research techniques for resolving this difficult integration problem as it applies to COEAS. The Analytical Hierarchy Process (AHP) is one technique. The AHP and supporting software was accessible for use in this analysis and was applied to the assessment of the relative logistics impact of NLOS-CA alternatives. Commercial software entitled "Expert Choice (TM)" was used to document, execute and support this application of AHP. "Expert Choice" is a Trademark of Decision Support Software, Inc.

G-2 References.

Cassady, Patrick G. and Goodwin, Gordon J., Multi-attribute Methodologies for Decision Making in COEAS, Project ID 6063, U.S. Army TRADOC, Ft Monroe, VA, May 1992.

Expert Choice (TM), Version 8, User Manual, Expert Choice, Inc, Decision Support Software, Inc, McLean, VA, 1983.

Saaty, Thomas L., The Analytic Hierarchy Process, McGraw-Hill Book Company, New York, 1980.

G.3 Methodology. The AHP is a decision support methodology based on comparison of alternatives against interrelated, multi-level criteria. To apply AHP, the analyst makes pairwise comparisons of alternatives and criteria based on an overall goal or objective. The decisions made at each comparison are quantified and combined mathematically to produce weighted priority rankings for choices at all levels of the hierarchy.

The AHP methodology has several advantages including the following:

- AHP structures the analysis by forcing the analyst to define analysis objectives, decision criteria and the relationships between those assessment criteria.

- AHP simplifies complex decisions by reducing the analysis process to the execution of pairwise decisions.
- Quantifies subjective judgments by assigning numerical values to judgments of degree.
- By quantifying all decisions, AHP allows the analyst to mix subjective and objective decisions.
- Measure the inconsistency of the decision tree.
- Supports what-if, sensitivity analysis of decision structure and outcomes.

The AHP also has several disadvantages as an analytical tool in this application.

- Execution of the methodology requires the application of judgment in assigning relative weights and making comparisons. As in all analysis, the quality of the output depends on the quality of the input decisions and judgments. Ideally, a number of subject matter experts would be queried to produce a consensus on relative weights and rankings required by AHP. However, time and resource constraints limited the contractor's ability to marshall this level of support. Judgments were produced by the analyst based on over 20 years experience in military logistics, and qualifications as Professional Engineer (P.E.) and Certified Professional Logistician (CPL). The basis for those judgments is documented to the greatest level of detail feasible.
- The mathematics on which the AHP is based can mask the influence of specific decisions on the analytical outcome as decisions at each level are "rolled" into calculations at the next higher level to produce an overall ranking of alternatives. A limited sensitivity analysis was conducted to test the sensitivity of the analysis to gross changes in decision weights. The results of sensitivity analyses are documented below.

The intent of this analysis is not to produce an absolute "measure" of logistics impact, but to assist the user of the report in understanding the overall perspective and relative influence of criteria on relative logistics impact. Further investigation of the AHP hierarchy is suggested.

The first step in conducting the AHP is definition of the analysis goal and construction of the analytical hierarchy. A generic representation of an analytical hierarchy is shown in Figure G-1.

WHICH ALTERNATIVE HAS THE GREATER IMPACT?

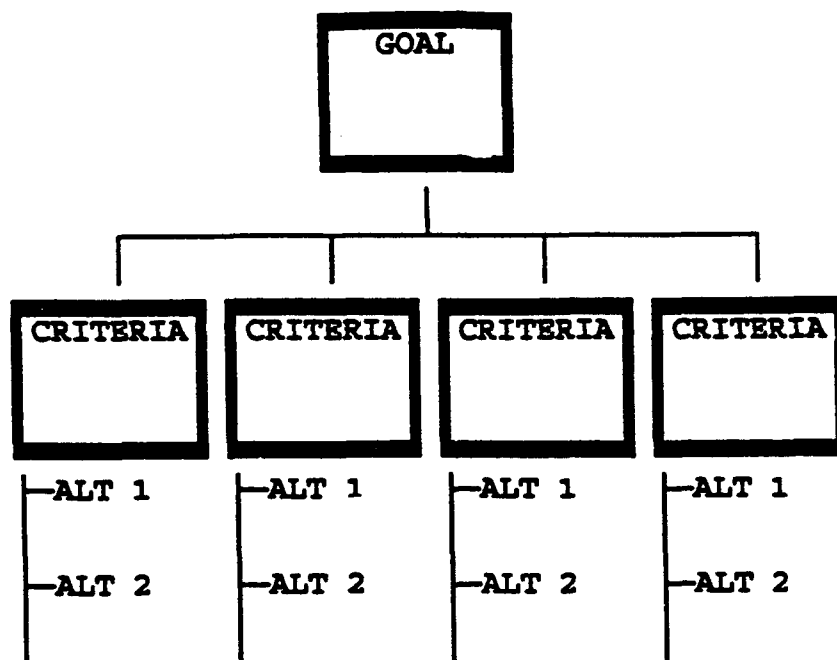


FIGURE G-1 Generic Analytical Hierarchy

The hierarchy describes the relationships and dependencies between criteria at each level of analysis.

The complete analytical hierarchy used for this analysis is depicted in Figure G-2.

The analysis goal is at the top of the hierarchy. Alternatives were placed at the bottom. The impact of the criteria at each level on the goal is determined by the impact of the criteria at the next lower level and by relationships between criteria/nodes at the same level. The analytical hierarchy created for the NLOS-CA LIA has five levels.

- Goal: The goal of the analysis is to determine the relative logistics impact of the alternative configurations defined as the NLOS-CA and the LRSM.
- EEA: The second level of analysis is EEA. As directed by the COEA, there are seven EEAs. Manpower/personnel is included as a single EEA. Logistics impact is ultimately determined by the relative influence and impact of the EEAs.
- Sub-analysis: The relative influence of EEAs is determined in part by the results of sub-analyses. There are nine (9) sub-analyses. Their relationship to individual EEAs is summarized in the Sub-analysis to EEA matrix, Figure 4-2.
- MOP/MOE: The relative influence of sub-analyses on the logistics impact is determined by associated MOP/MOEs. There are thirty-one (31) MOPs/MOEs.
- Alternatives: Alternatives 1 and 2 are placed at the bottom of the hierarchy.

The decision model incorporated in Expert Choice will rank the alternatives at the bottom of the hierarchy against the goal according to the relative importance of the criteria using matrix algebra.

The most critical analytical step in the AHP is the definition of the decision hierarchy. Once that is complete, each node at each level is compared to peer nodes one at a time in a process named pairwise comparison. This approach relieves the analyst of the virtually impossible task of assessing the relative impact of 31 MOPs/MOEs via one analytical step and of attempting to compare unrelated variables such as tons of ammunition and manpower requirements.

Alternatives were compared against each other in each MOP/MOE and a relative magnitude assigned to the differences. For example, alternative 1 requires 2 times as many gallons of fuel per day as Alternative 2.

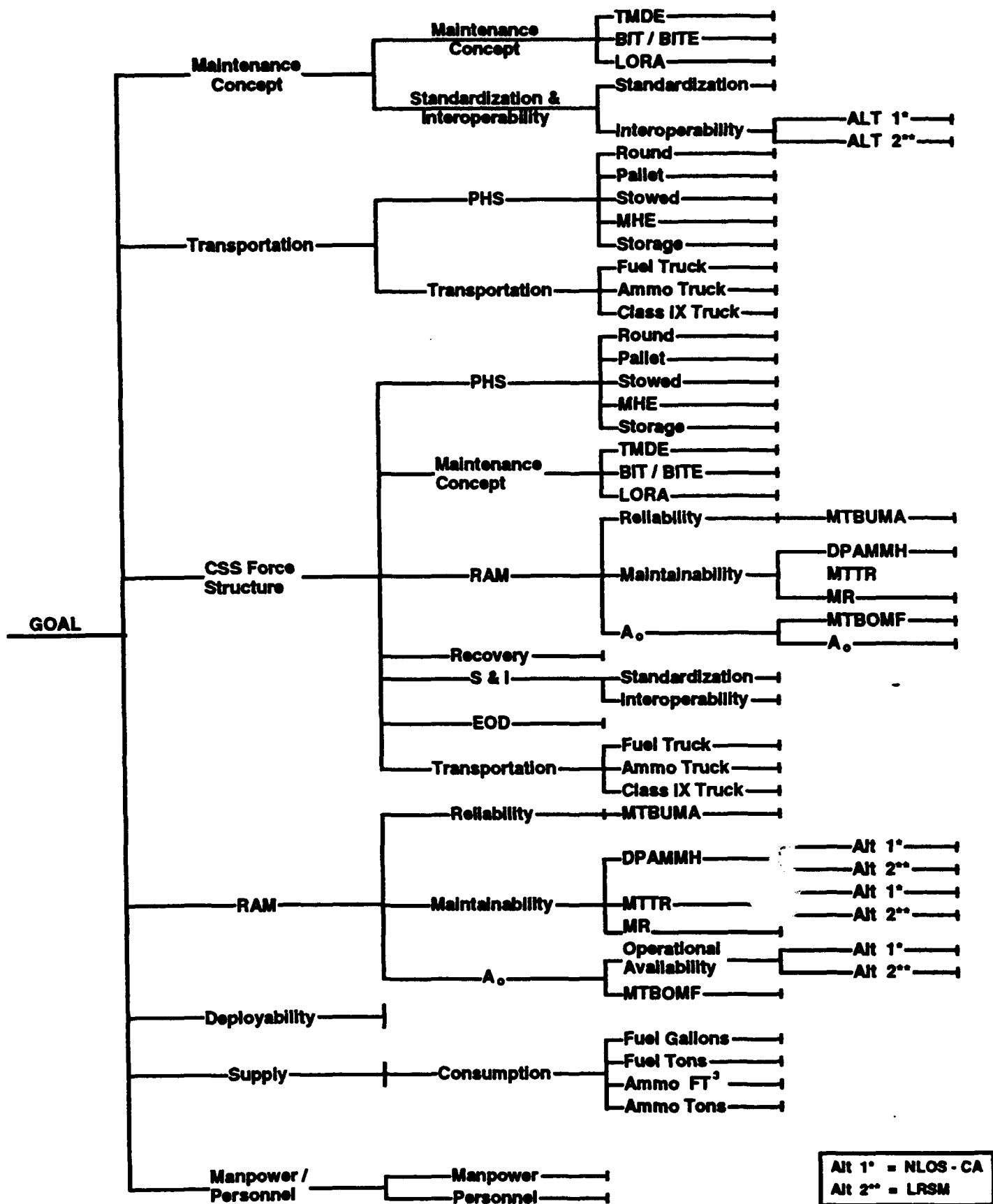


FIGURE G-2 Logistics Impact

- The relative influence of each MOP was compared to other MOPs for each sub-analysis. For example, the influence of gallons of fuel per day is much stronger (5 times) than tons of Class IX per day on the logistics impact of supply.
- The relative influence of each sub-analysis on the logistics impact of associated EEAs was then assessed. For example, manpower is 3 times more important than supply in determining the logistics impact of the CSS Force Structure EEA.
- Each EEA was compared against other EEAs to determine the relative influence of each on overall logistics impact of the alternatives.

Comparisons at each node are quantified, and the values entered in a decision matrix. Matrix algebra is used to calculate weights and to rank the choices by those weights at each level and for the entire hierarchy.

An inconsistency factor is also calculated via matrix algebra. If the analyst determines, that A is greater than B and B is greater than C. Then, logically, A should be greater than C. This is not always true when making subjective comparisons. The AHP incorporates logical inconsistencies within the analysis process. Then, some inconsistency is usually desired in subjective decision making environment, however, the inconsistency factor enables the analyst to evaluate the decision matrix and reduce undesired inconsistency.

G.4 Analysis:

The execution of the AHP is a series of pairwise comparisons between each criteria. The following rules were applied to comparisons:

- When values were available, as in the case of many MOPs, these values were used as the basis for comparison. Subjective evaluations were made in the absence of hard data. In making these comparisons, logistics impact was always measured as "negative," i.e., an increased burden or requirement.
- Criteria for assessing logistics impact were defined to aid the analysis process. Logistics impact was assessed according to three levels: force structure impacts, pipeline volume impacts and process/procedure impacts.
- Force Structure impacts include changes which increase manpower, or equipment requirements, or which require significant TOE changes.
- Pipeline volume impacts are increases in supply or workload

volume which increase the burden on the logistics system, but which do not measure or increase manpower or equipment requirements. Increases in tons of ammunition is a pipeline volume impact. Increases in transportation truckloads is a force structure impact.

- Process or procedure impacts change the organization or procedures for providing support. When a maintenance support concept changes, for example, the reorganization driven by this change has a significant impact on the logistics system, but force structure impacts may be minimal if workload is only reallocated among existing assets.
- Force Structure impacts are greater than Pipeline volume impacts and both are greater than process or procedure impacts.

G.4.1 Comparison by MOP/MOE. Comparisons and weighing of alternatives at the MOP level were based on the results of analysis conducted for each MOP/MOE. A summary of the results of those comparisons is provided in **Figure G-3.** Comparison and weighing of EEA influences on logistics impact were subjective judgments based on the analysts' experience and expertise in military logistics. Those comparisons are summarized as follows:

TRANSPORTATION EEA vs MAINTENANCE EEA

Both EEAs have potential force structure impacts. Transportation affects the number of trucks and truck driven manpower. The Maintenance EEA deals with organization and process for providing maintenance support. Manpower and force structure changes are secondary in the maintenance EEA.

The Transportation EEA, however, has a direct impact on force structure. Any change in the number of trucks required to support the weapon system, also has a direct impact on manpower, fuel, and repair parts as well as equipment.

Assessment: The Transportation EEA has a great influence on logistics impact than the Maintenance EEA.

CSS FORCE STRUCTURE vs MAINTENANCE

Force Structure EEA changes drive changes in manpower, process, and organization. The Maintenance EEA drives changes in the maintenance process and organization only.

Assessment: Force Structure has a greater influence on logistics impact than the Maintenance EEA.

The Logistics Impact of NLOS - CA is How Many Times Greater Than the Logistics Impact of the LRSM?

NLOS - CA	NLOS - CA > LRSM Scale LRSM > NLOS - CA										LRSM
	Equal										
Fuel Gal Per Day	9	7	5	3	1	3	5	7	9		Fuel Gal Per Day
Fuel Tons Per Day	9	7	5	3	1	3	5	7	9		Fuel Tons Per Day
Ammo Tons Per Day	9	7	5	3	1	3	5	7	9		Ammo Tons Per Day
Ammo CUFT Per Day	9	7	5	3	1	3	5	7	9		Ammo CUFT Per Day
Round Dimensions	9	7	5	3	1	3	5	7	9		Round Dimensions
Pallet Size	9	7	5	3	1	3	5	7	9		Pallet Size
Stowed Rounds	9	7	5	3	1	3	5	7	9		Stowed Rounds
Material Handling Equipment	9	7	5	3	1	3	5	7	9		Material Handling Equipment
Storage	9	7	5	3	1	3	5	7	9		Storage
TMDE	9	7	5	3	1	3	5	7	9		TMDE
Maintenance Concept	9	7	5	3	1	3	5	7	9		Maintenance Concept
MTBOMF	9	7	5	3	1	3	5	7	9		MTBOMF
MTBUMA	9	7	5	3	1	3	5	7	9		MTBUMA
MTTR	9	7	5	3	1	3	5	7	9		MTTR
MR	9	7	5	3	1	3	5	7	9		MR
DPAMMH	9	7	5	3	1	3	5	7	9		DPAMMH
A ₀	9	7	5	3	1	3	5	7	9		A ₀
Fuel Trucks Per Day	9	7	5	3	1	3	5	7	9		Fuel Trucks Per Day
Ammo Trucks Per Day	9	7	5	3	1	3	5	7	9		Ammo Trucks Per Day
Deployability	9	7	5	3	1	3	5	7	9		Deployability
Recoverability	9	7	5	3	1	3	5	7	9		Recoverability
EOD	9	7	5	3	1	3	5	7	9		EOD
Standardization	9	7	5	3	1	3	5	7	9		Standardization
Interoperability	9	7	5	3	1	3	5	7	9		Interoperability
Manpower	9	7	5	3	1	3	5	7	9		Manpower
Personnel	9	7	5	3	1	3	5	7	9		Personnel

1 = Equal
 3 = Moderately Greater
 5 = Strongly Greater
 7 = Very Strongly Greater
 9 = Extremely Greater

SCALE

▲ = Location on Scale

LOGISTICS IMPACT COMPARISON SUMMARY
NLOS-CA vs LSRM for MOP / MOE

FIGURE G - 3

RAM vs MAINTENANCE

Changes in RAM impact the logistics support volume at the system level, i.e. more man-hours, more repair actions, more repair parts. These changes do not convert to force structure (manpower and equipment) impacts until they are aggregated in the manpower, and supply EEAs. The maintenance EEA addresses process and organization.

Assessment: RAM and Maintenance have equal influence on logistics impact.

TRANSPORTABILITY/DEPLOYABILITY vs MAINTENANCE

The Transportability/deployability EEA addresses the logistics resources and support required to conduct intra- and inter theater movement of units. Transportability/deployability determines transport aircraft requirements and support (fuel, maintenance, operations, etc), and other modes of transportation and support.

Assessment: Transportability/deployability has a greater influence on logistics impact.

SUPPLY vs MAINTENANCE

The Supply EEA measures changes in volume of supplies moving through the pipeline. Impacts are indirect. They include increased workload, efficiency, and overhead. Volume is not converted to force structure at this point, but is converted in the Transportation EEA.

Assessment: Supply and Maintenance have equal influence on logistics impact.

MANPOWER vs MAINTENANCE

The Manpower EEA addresses the impacts of changes in manpower requirements. The impact on logistics forces structure is therefore significant.

Assessment: Manpower/Personnel has greater influence on logistics impact.

CSS FORCE STRUCTURE vs TRANSPORTATION

CSS Force Structure changes affect equipment, manpower and organization for logistics support. The Transportation EEA reflects the logistics changes of impacts in one functional area-supply.

Assessment: CSS Force Structure has a greater influence on logistics

impact.

TRANSPORTATION vs RAM

Changes in the RAM EEA impact the volume of logistics support. The forces structure impacts of RAM changes is documented in other EEAs. Transportation, measures increase or decrease in truckloads and support resources required to move Class III, V, and IX supplies.

Assessment: Transportation has a greater influence on logistics impact.

DEPLOYABILITY VS TRANSPORTATION

Deployability and Transportation EEAs both impact equipment and manpower support requirements. However, deployability addresses the air transportation resources which are a scarce resource and which entail a broader spectrum of dedicated support.

Assessment: Transportability/deployability and Transportation EEAs have an equal influence on logistics impact.

TRANSPORT vs SUPPLY

The Transport EEA includes equipment and manpower impacts. The Supply EEA addresses logistics pipeline process volume.

Assessment: Transportation has greater influence on logistics impact.

TRANSPORT vs MANPOWER

Transportation and Manpower EEAs both impact equipment and manpower requirements. Manpower, however, includes manpower requirements in all functional areas.

Assessment: Manpower/Personnel has a greater influence on logistics impact than Transportation.

CSS vs RAM

CSS Force Structure reflects impacts on equipment, manpower and process for logistics support. RAM reflects pipeline volume impacts.

Assessment: CSS Force Structure has a greater influence on logistics impact.

CSS FORCE STRUCTURE vs DEPLOYABILITY

Both EEAs reflect impacts on force structure. CSS Force Structure is more comprehensive, however, Deployability is more critical to readiness and involves scarce air transport resources.

Assessment: These EEAs have an equal influence on logistics impact.

CSS FORCE STRUCTURE vs SUPPLY

CSS Force Structure is comprehensive force structure impacts. Supply is pipeline volume impacts.

Assessment: CSS Force Structure has greater influence on logistics impact.

MANPOWER vs CSS FORCE STRUCTURE

Both affect force structure/manpower requirements. The Manpower EEA has a stronger effect on logistics impact because it includes operators and other non-logistics, non-system specific manpower requirements.

Assessment: Both EEAs have an equal influence on logistics impact.

TRANSPORTABILITY/DEPLOYABILITY vs RAM

Transportability/deployability drives force structure requirements for transport assets and support. RAM affects logistics pipeline volume.

Assessment: Transportability/Deployability has a great influence on logistics impact.

SUPPLY vs RAM

Both are volume impacts. Supply has moderately more logistics impact because of the magnitude of the supplies involved and the handling requirements for those supplies.

Assessment: Both EEAs have an equal influence on logistics impact.

MANPOWER vs RAM

Manpower/personnel is a force structure/resource issue. RAM is a pipeline volume issue.

Assessment: Manpower/personnel has a greater influence on logistics impact.

TRANSPORTABILITY/DEPLOYABILITY vs SUPPLY

Transportability/deployability is a force structure issue. Supply is a pipeline volume issue.

Assessment: Transportability/deployability has a greater influence on logistics impact.

SUPPLY vs MANPOWER/PERSONNEL

Supply is a pipeline volume issue. Manpower/personnel affects force structure and support resource requirements.

Assessment: Manpower/personnel has a greater influence on logistics impact.

G.4 Logistics Impact Summary. The relative logistics impact of Alternative 1 and 2 overall, and in each EEA are displayed in Figure G-4. The height of each bar represents the priority weighing calculated by the AHP. Figure G-5 shows the relative influence and weight of each of the EEAS in determining the overall logistics impact. Clearly, Force Structure exerted the greatest influence in determining logistics impact. Supply exerted the least influence. The final priority values calculated for each alternative are a function of judgments and decisions made in performing comparisons at each level of the hierarchy. It is appropriate to question the impact of judgmental errors on the outcome of the analysis. Given sufficient time and resources, a complete sensitivity analysis should be conducted to assess the risk associated with the analytical hierarchy applied in this assessment. In this case a limited sensitivity assessment of two variables was conducted. In the first sensitivity analysis, the priority weight of CSS Force Structure was reduced by a factor of ten. In the second sensitivity analysis, the priority weight of the supply EEA was increased by a factor of ten. The results of these analyses are displayed in Figure G-6. It is apparent that significant changes in these two variables had little impact on overall logistics impact.

G.5 Conclusions. The logistics impact of the LRSM is marginally greater than the logistics impact of the NLOS-CA. CSS Force Structure is the most important variable in determining these differences, supply being the least important. Sensitivity analyses which varied CSS Force Structure and Supply showed overall logistics impact to be relatively insensitive to changes in criteria weights. This indicates there is no single supportability factor which can be changed to affect the relative impact of the two alternatives.

LOGISTICS IMPACT SUMMARY

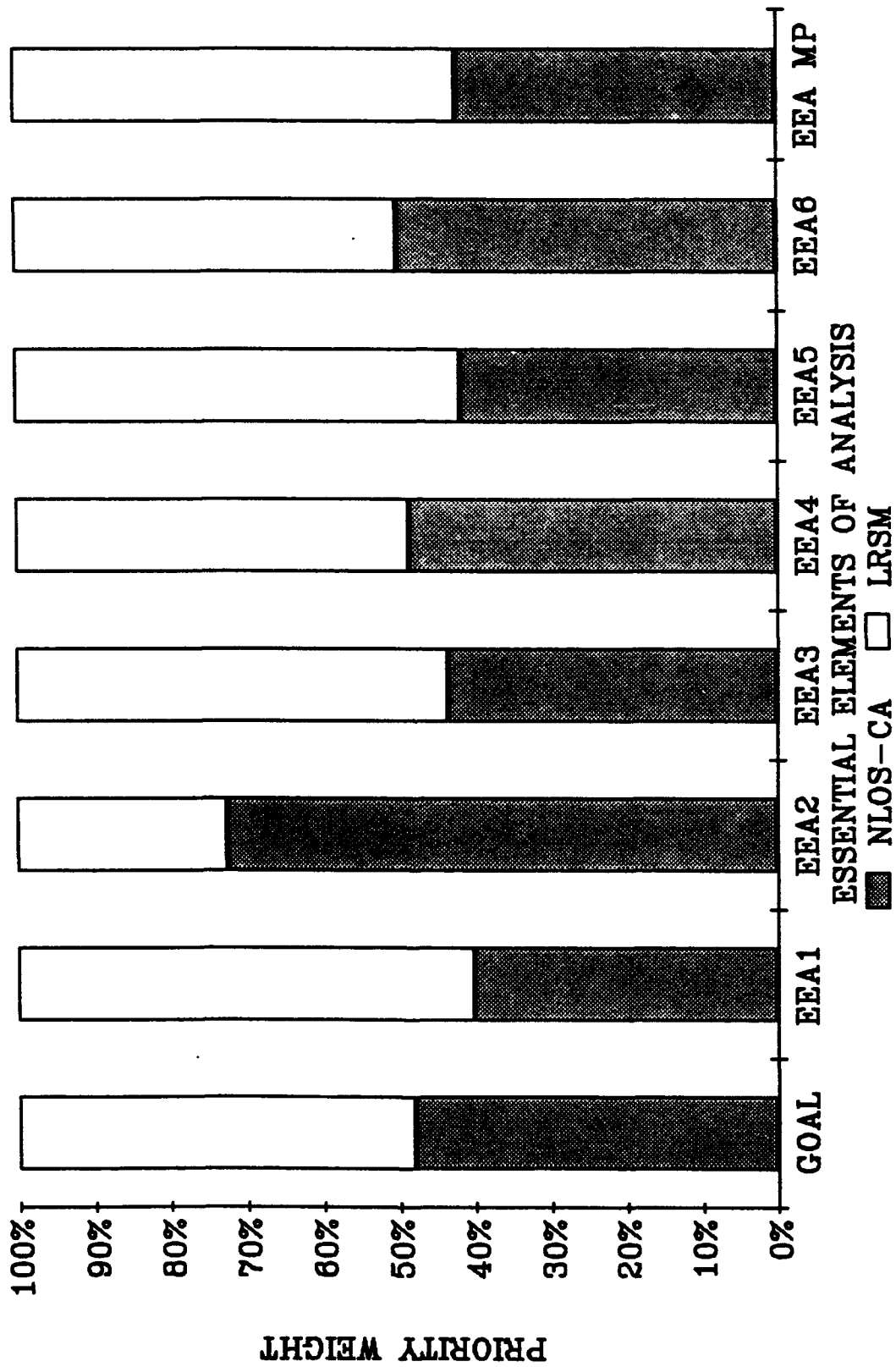


FIGURE G-4

EEA RELATIVE WEIGHT VS LOG IMPACT

LRSM=.520 NLOS-CA=.480

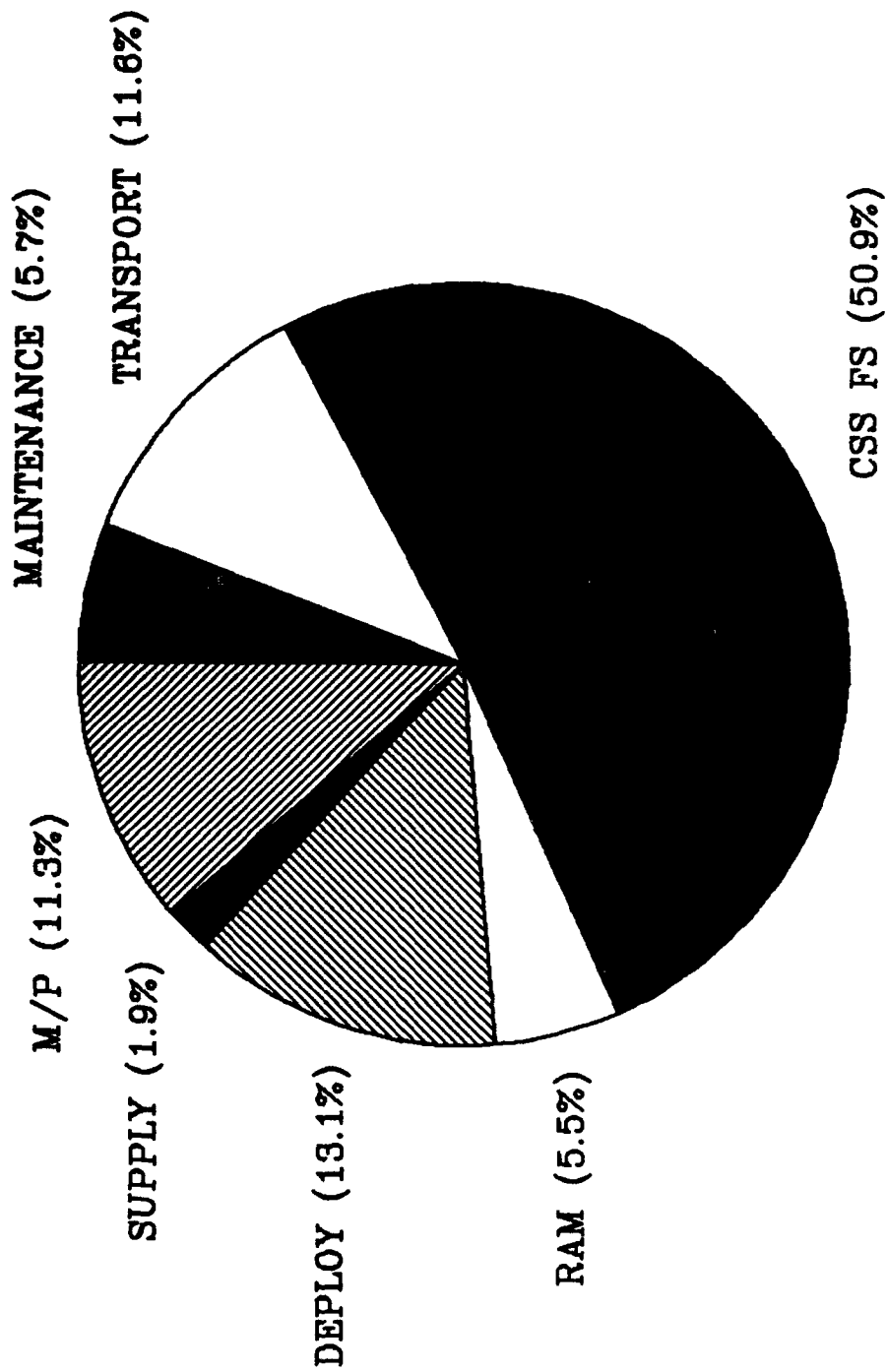


FIGURE G-5

SENSITIVITY RESULTS RELATIVE LOGISTICS IMPACT

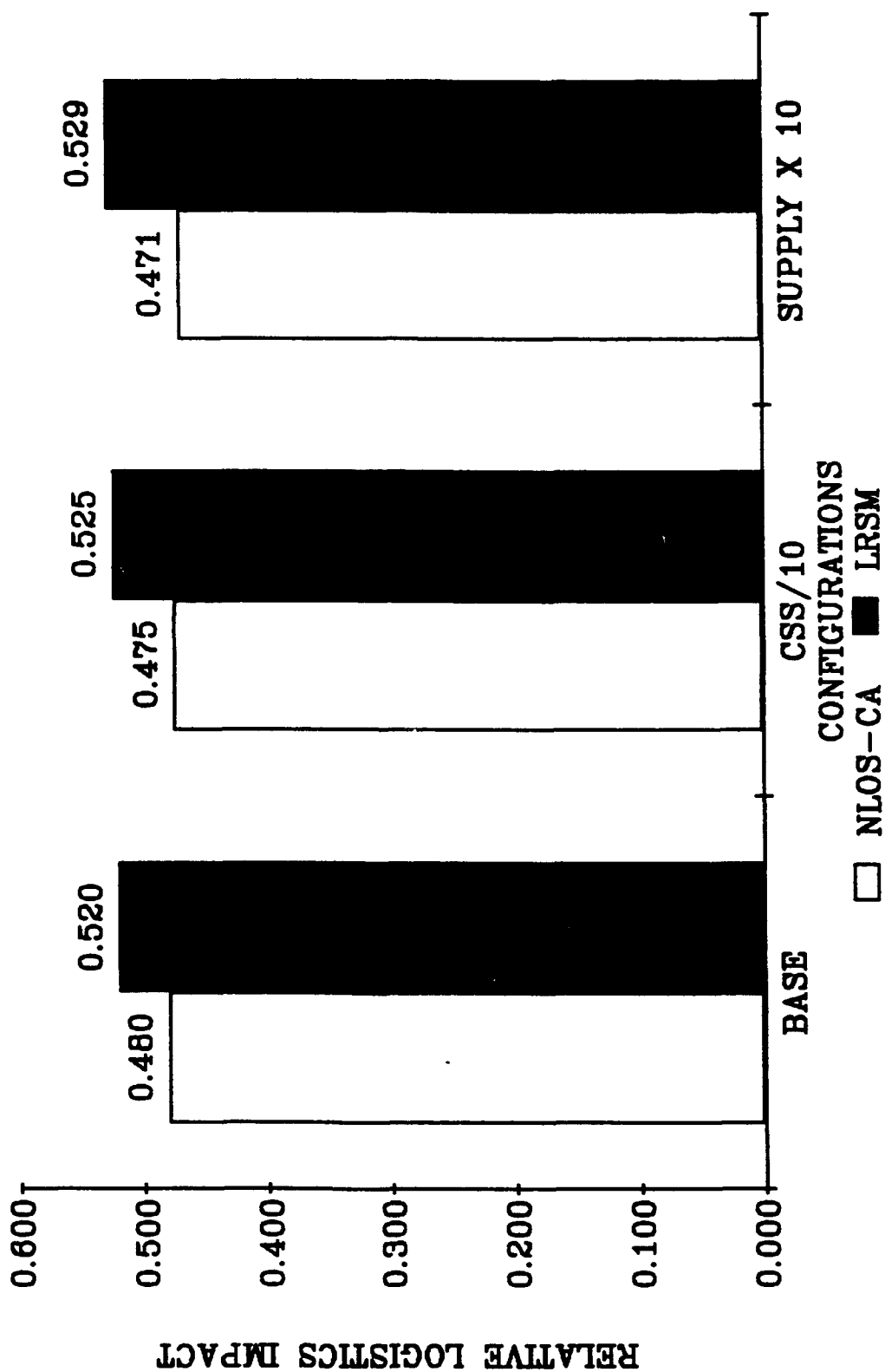


FIGURE G-6

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX H
MANPOWER TABLES**

TABLE H-1

UNIT MANPOWER REQUIREMENTS NLOS-CA CO HEAVY DIVISION LRSN

NOS	DTOE NLOS LRSN CO HVY	PROJECTED NLOS LRSN CO HVY	DELTA DTOE VS PROJECTED	NLOS CO LRSN PROJECTED GRADE
11A00	0.00	0.00	0.00	0.00 D5
11A00	0.00	0.00	0.00	0.00 D4
11A00	1.00	1.00	0.00	1.00 D3
11A00	4.00	4.00	0.00	4.00 D2
11C5M	1.00	1.00	0.00	1.00 E8
11C50	2.00	2.00	0.00	2.00 E8
11C40	4.00	4.00	0.00	4.00 E7
11C30	4.00	4.00	0.00	4.00 E6
11C20	16.00	16.00	0.00	16.00 E5
11C10	24.00	24.00	0.00	24.00 E4
11C10	32.00	32.00	0.00	32.00 E3
24M10	0.00	0.00	0.00	0.00 E4
24M10	0.00	0.00	0.00	0.00 E3
31U30	1.00	1.00	0.00	1.00 E6
31U20	0.00	0.00	0.00	0.00 E5
31U10	1.00	1.00	0.00	1.00 E4
52D10	0.00	1.00	1.00	1.00 E4
54B20	1.00	1.00	0.00	1.00 E5
54B10	0.00	0.00	0.00	0.00 E4
63B20	1.00	1.00	0.00	1.00 E5
63B10	1.00	1.00	0.00	1.00 E4
63B10	1.00	0.00	-1.00	0.00 E3
63J20	0.00	0.00	0.00	0.00 E5
63J10	0.00	1.00	1.00	1.00 E4
63J10	0.00	0.00	0.00	0.00 E3
63S20	0.00	0.00	0.00	0.00 E5
63S10	0.00	2.00	2.00	2.00 E4
63S10	0.00	0.00	0.00	0.00 E3
63T40	1.00	1.00	0.00	1.00 E7
63T30	1.00	1.00	0.00	1.00 E6
63T20	2.00	2.00	0.00	2.00 E5
63T10	2.00	3.00	1.00	3.00 E4
63T10	1.00	1.00	0.00	1.00 E3
77F20	0.00	0.00	0.00	0.00 E5
77F10	0.00	0.00	0.00	0.00 E4
77F10	1.00	1.00	0.00	1.00 E3
88M30	1.00	0.00	-1.00	0.00 E6
98M20	2.00	1.00	-1.00	1.00 E5
88M10	0.00	2.00	2.00	2.00 E4
88M10	0.00	0.00	0.00	0.00 E3
92A10	0.00	0.00	0.00	0.00 E4
92A10	1.00	1.00	0.00	1.00 E3
92Y30	1.00	1.00	0.00	1.00 E6
92Y20	0.00	0.00	0.00	0.00 E5
92Y10	1.00	1.00	0.00	1.00 E4
92Y10	0.00	0.00	0.00	0.00 E3
94B10	1.00	1.00	0.00	1.00 E4
OFFICER	5.00	5.00	0.00	5.00
WARRANT	0.00	0.00	0.00	0.00
ENLISTED	104.00	107.00	3.00	107.00
TOTAL	109.00	112.00	3.00	112.00

TABLE H-2

FRACTIONAL MANPOWER REQUIREMENTS FOR DS AND GS MAINT DEMAND

DS NPR BY MOS

27E	0.8131
27U	0.0000
29E	0.2209
29J	0.0103
29N	0.0550
29S	0.0007
35H	0.0460
39E	0.1507
43M	0.0000
44B	0.0033
44E	0.0008
45B	0.0424
456	0.0008
52D	0.1646
62B	0.0209
63H	1.2068
63J	0.0863
63W	0.3444

GS NPR BY MOS

27E	0.5087
27U	0.0000
29E	0.0447
29N	0.0115
29S	0.0018
35H	0.0762
39B	0.0016
39E	0.0417
44B	0.0017
44E	0.0000
45B	0.0107
456	0.0036
52D	0.0954
62B	0.0069
63H	0.6165
63J	0.0659
63W	0.2298

TABLE H-3

11C POSITIONS BY PARAGRAPH

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTA
101	HQ SECTION	1					2	3
103	PLATOON HQ	2	0	0	0	0	2	4
104	MORTAR SECTION		4	4	4	0	4	16
105	MORTAR SQUAD		0	0	12	24	24	60
	LRSN CD TOTAL	3	4	4	16	24	32	83

11C POSITIONS BY PARAGRAPH

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTA
101	HQ SECTION	1					2	3
103	PLATOON HQ	2	0	0	0	0	2	4
104	MORTAR SECTION		4	4	4	0	4	16
105	MORTAR SQUAD		0	0	12	24	24	60
	LRSN CD TOTAL	3	4	4	16	24	32	83

BATTALION TOTAL	3	4	4	16	24	32	83
NON SYSTEM DRIVEN	3	4	4	4	0	8	23
SYSTEM DRIVEN	0	0	0	12	24	24	60

TABLE H-4

EQUIPMENT SECTION MLOS-CA CO HEAVY DIVISION LRSN

LIN	NOMENCLATURE	QTY REQ
A22496	AIMING CIRCLE	4
A32355	ALARM CHEM AGENT	5
A56243	ANALYZER SET ENGINE	1
A79381	ANTENNA GROUP OE-254(1)/GRC	11
A79449	ANTENNA GROUP OE-303/GRC	1
C05341	CONTROL REC TRANS: C-11561(C)/U	3
C05701	MONITOR CHEM AGENT	2
C10990	CARRIER 120MM MORTAR	12
C10990 *		12
C10990 *		12
C18234	CARRIER PERS FULL TRXED ARMD (RISE)	4
C18234 *		4
C18234 *		4
C60294	COMPUTER SET BALLISTICS: MORTAR M23	8
C62375	BATTERY CASE: Z-AIJ-EI	3
D11538	CARRIER COMMAND POST: LT TRACKED	1
D11538 *		1
D11538 *		1
D11538 *		1
D99573	CHARGER BATTERY: PP-34/MSM	1
E00533	CHARGER RADIAC DETECT	5
E56896	CMBT VEH ANTI TANK: IMP TOW W/O TON MPN SYS	0
E63728	COMPASS MAGNETIC UNMTD	16
E70064	COMP UNIT RCP TRK 2 MHL PNEU TIRE GAS DRVN	1
E98103	ELEC TRANSFER KEY KYK-13/TSEC	3
F55553	DISTRIBUTION SYS ELEC 120V 1PH 60AMP	1
G11966	GEN SET DED SKID MTD 5KW 60HZ	1
G18358	GEN SET DED SKID MTD 3KW	1
H25866	HEATER RATION INDIV: MTD TRPS	18
J31297	INST KIT MK-2195/VRC-87/88/90 2 1/2 5 TON	1
J31569	INSTL KIT 87,88,90 HMMWV	1
J47151	INST KIT 87,88,89 M987,984,988	0
J47457	INSTL KIT 89,91,92 HMMWV	7
J87848	INSTL KIT MK-2499/VRC FOR TSEC/KY-57 WITH SINCG	0
K23814	HEADSET-MICROPHONE: H-182/PT	12
L44595	LAUNCHER GRENADE 40MM: SGLE SHOT RIFLE MTD BTCH	0
L44748	LAUNCHER GRENADE ARMAMENT SUBSYSTEM	0
L63994	LIGHT SET GEN ILLUM 25 OUTLET	2
L67021	LAUNCHER GRENADE SMOKE	0
L91975	MACHINE GUN CALIBER .50	13
L92386	MACHINE GUN 7.62MM	1
M09009	MACHINE GUN 5.56MM	4
M12418	MASK CBR M40	107
M14381	MAST AB-903/G	8
M18526	MASK CBR CMBT VEH M42	0
M60449	MULTIMETER DIGITAL AM/PSN-45	4
M68405	MORTAR 120 MM	12
M68405 *		12
M74364	MOUNT GUN RING CAL .50	1
M75577	MOUNT TRIPOD MACH GUN HVY CAL .50	13
M75714	MOUNT TRIPOD MACH GUN 7.62 MM	5
M02758	NET CONTROL DEVICE	4

TABLE H-4 (CON'T)

N04596	NIGHT VISION SIGHT CREW SERVED WEAPON AN/TVS-5	13
N04732	NIGHT VISION SIGHT INDIV SERVD WPN AN/PVS-4	9
N05050	NIGHT VISION SIGHT SET AN/UAS-11	0
N05482	NIGHT VISION GOGGLES AN/PVS-7B	61
P07900	PLOTTING BOARD INDIRECT FIRE AZIMUTH	20
P40750	POWER SUPPLY PP-6224/U	4
P70517	PURGING KIT FIRE CONTROL: ORG MAINT	1
P98152	PISTOL 9MM AUTOMATIC: M9	15
Q20935	RADIACETER IM-93/UD	8
R20684	RADIAC SET AN/VDR-2	5
R30895	RADIO SET AN/GRC 213	0
R30925	RADIAC SET AN/PDR-75	1
R67194	RADIO SET AN/VRC-87A	8
R67194	RADIO SET AN/VRC-88A	12
R68010	RADIO SET AN/VRC-91A	0
R67908	RADIO SET AN/VRC-90A	3
R45339	RADIO SET AN/VRC-92	12
R55268	RADIO SET AN/PRC-119	3
R56742	REEL EQUIPMENT CE-11	5
R59160	REELING MACHINE CABLE	9
R93169	RADIO TEST SET AN/PRM-34	1
R95035	RIFLE 5.56 MM M16A2	97
R97234	RIFLE 5.56 MM M4	0
S01373	SPEECH SECURITY EQUIP TSEC/KY-57	1
T07679	TRK UTIL HVY VARIANT HMMV	0
T25726	TONE-SIGNALING ADAPTER TA-977	1
T39518	TRK CGO TACT 8X8 HENMT W/M W/LT CRANE	3
T40405	TAPE READER GP K01-18/TSEC	2
T45593	SIGHT BORE OPTICAL	4
T61494	TRUCK UTIL: CGO/TRP M998 HMMV	4
T63093	TRUCK WRKR TAC 8X8 HENMT W/M W/LT CRANE	1
T87243	TRUCK TANK FUEL SVC6 2500 GAL HENMT	1
T87243 *		0
T92242	TRK UTIL ARMT CARRIER HMMV	0
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-993/6T	4
U81707	SWITCHBOARD TELEPHONE MANUAL: SB-22/PT	1
U89185	UTILITY RECEPTACLE	1
V31211	TELEPHONE SET TA312	26
V98788	POWER SUPPLY VEN MYP-57/TSEC	2
W32593	SHOP EQUIP AUTO MAINT	1
W32867		1
W65747	TOOL SET VEN FULL TRACKED	1
W95537	TRLR CGO 3/4 TON 2 WNL W/E	0
W95537 *		0
W95811	TRLR CGO 1 1/2T M105	0
W95811 *		0
W98825	TRLR TANK WATER 400 GAL M149A2	1
X40794	TRUCK CARGO DROP SIDE 6X6 W/E M923A1	0
X40831	TRUCK CARGO 5 TON 6X6 LWD W/E	0
Z40430	TRUCK CGO LHTV W/E	4
Z09000	LOGHARS(T) COMM MODEN BRP	1
Z25291	ELECTRONIC NOTEBOOK (EN): AN/CY2-7	22
Z28175	GN SYS FIBER OPTICS-IT: MLOS-CA	0
Z28175*		0

TABLE H-4 (CON'T)

Z32890	HEATER DUCT TYPE PTL	1
Z32890 *		1
Z36068	TLR CGO LMTV W/DROPSIDES	3
Z36272	TLR CGO HIGH MOBILITY	1
Z37833	TRMR MISSILE ASMOLY MASS SIM	0
Z43330	MISSILE GUIDED FIBER OPTICS	0
Z50144	LOGMARS(T) MICROPRO GRP	1
Z62381	RECOVERY VEHICLE FULL TRACKED	1
Z62381 *		1
Z62381 *		1
Z62381 *		1
Z62381 *		1
Z62381 *		1
Z67950	MOUNT TRIPOD MACH GUN XM192	1
Z94047	TRUCK TANK POL MTV W/E	0
Z94047 *		0
Z94433	TRUCK WRECKER MTV W/M W/E	0
Z95931	VEHICLE POWER CONDITIONER (VPC)	1

TABLE H-5

UNIT MANPOWER REQUIREMENTS MLOS-CA CO LIGHT DIVISION LRSH

NOS	DTOE	PROJECTED	DELTA	MLOS CO
	MLOS LRSH	MLOS LRSH	DTOE VS	LRSH
	CO LT	CO LT	PROJECTED	CO LT GRADE
11A00	0.00	0.00	0.00	0.00 05
11A00	0.00	0.00	0.00	0.00 04
11A00	1.00	1.00	0.00	1.00 03
11A00	4.00	4.00	0.00	4.00 02
11CSN	1.00	1.00	0.00	1.00 E8
11CS0	2.00	2.00	0.00	2.00 E8
11C40	4.00	4.00	0.00	4.00 E7
11C30	4.00	4.00	0.00	4.00 E6
11C20	16.00	16.00	0.00	16.00 E5
11C10	24.00	24.00	0.00	24.00 E4
11C10	32.00	32.00	0.00	32.00 E3
24N10	0.00	0.00	0.00	0.00 E4
24N10	0.00	0.00	0.00	0.00 E3
31U30	1.00	1.00	0.00	1.00 E6
31U20	0.00	0.00	0.00	0.00 E5
31U10	1.00	1.00	0.00	1.00 E4
52B10	0.00	1.00	1.00	1.00 E4
54B20	1.00	1.00	0.00	1.00 E5
54B10	0.00	0.00	0.00	0.00 E4
63B20	1.00	1.00	0.00	1.00 E5
63B10	1.00	0.00	-1.00	0.00 E4
63B10	1.00	1.00	0.00	1.00 E3
63J20	0.00	0.00	0.00	0.00 E5
63J10	0.00	1.00	1.00	1.00 E4
63J10	0.00	0.00	0.00	0.00 E3
63S20	0.00	0.00	0.00	0.00 E5
63S10	0.00	2.00	2.00	2.00 E4
63S10	0.00	0.00	0.00	0.00 E3
63T40	0.00	0.00	0.00	0.00 E7
63T30	0.00	0.00	0.00	0.00 E6
63T20	0.00	0.00	0.00	0.00 E5
63T10	0.00	0.00	0.00	0.00 E4
63T10	0.00	0.00	0.00	0.00 E3
77F20	0.00	0.00	0.00	0.00 E5
77F10	0.00	1.00	1.00	1.00 E4
77F10	1.00	1.00	0.00	1.00 E3
88M30	1.00	0.00	-1.00	0.00 E6
88M20	2.00	0.00	-2.00	0.00 E5
88M10	0.00	2.00	2.00	2.00 E4
88M10	0.00	0.00	0.00	0.00 E3
92A10	0.00	0.00	0.00	0.00 E4
92A10	1.00	1.00	0.00	1.00 E3
92Y30	1.00	1.00	0.00	1.00 E6
92Y20	0.00	0.00	0.00	0.00 E5
92Y10	1.00	1.00	0.00	1.00 E4
92Y10	0.00	0.00	0.00	0.00 E3
94B10	1.00	1.00	0.00	1.00 E4
OFFICER	5.00	5.00	0.00	5.00
WARRANT	0.00	0.00	0.00	0.00
ENLISTED	97.00	99.00	2.00	99.00
TOTAL	102.00	104.00	2.00	104.00

TABLE H-6

FRACTIONAL MANPOWER REQUIREMENTS FOR DS AND GS MAINT DEMAND

DS NPR BY NOS

27E	0.8131
27U	0.0000
29E	0.1086
29J	0.0103
29N	0.0550
29S	0.0007
35H	0.0460
39E	0.1507
43H	0.0000
44B	0.0033
44E	0.0008
45B	0.0405
45G	0.0008
52D	0.1120
62B	0.0209
63H	0.1856
63J	0.0364
63M	0.9631

GS NPR BY NOS

27E	0.5087
27U	0.0000
29E	0.0447
29N	0.0115
29S	0.0018
35H	0.0762
39B	0.0016
39E	0.0417
44B	0.0017
44E	0.0000
45B	0.0102
45G	0.0036
52D	0.0660
62B	0.0069
63H	0.0000
63J	0.0310
63M	0.6566

TABLE H-7

11C POSITIONS BY PARAGRAPH DTOE

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTAL
101	HQ SECTION	1					2	3
103	PLATOON HQ	2	0	0	0	0	2	4
104	MORTAR SECTION		4	4	4	0	4	16
105	MORTAR SQUAD		0	0	12	24	24	60
	LRSM CO TOTAL	3	4	4	16	24	32	83

11C POSITIONS BY PARAGRAPH PROJECTION

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTAL
101	HQ SECTION	1					2	3
103	PLATOON HQ	2	0	0	0	0	2	4
104	MORTAR SECTION		4	4	4	0	4	16
105	MORTAR SQUAD		0	0	12	24	24	60
	LRSM CO TOTAL	3	4	4	16	24	32	83

BATTALION TOTAL	3	4	4	16	24	32	83
NON SYSTEM DRIVEN	3	4	4	4	0	8	23
SYSTEM DRIVEN	0	0	0	12	24	24	60

TABLE H-8

EQUIPMENT SECTION WLOS-CA CO LIGHT DIVISION LRSN

LIN	NOMENCLATURE	QTY REQ
A22496	AIMING CIRCLE	4
A32353	ALARM CHEM AGENT	5
A56243	ANALYZER SET ENGINE	1
A79381	ANTENNA GROUP OE-254()/GRC	11
A79449	ANTENNA GROUP OE-303/GRC	1
C05541	CONTROL REC TRANS: C-11561(C)/U	3
C05701	MONITOR CHEM AGENT	2
C10990	CARRIER 120MM MORTAR	0
C10990 *		0
C10990 *		0
C18234	CARRIER PERS FULL TRKED ARMD (RISE)	0
C18234 *		0
C18234 *		0
C60294	COMPUTER SET BALLISTICS: MORTAR M23	8
C62375	BATTERY CASE: Z-A1J-E1	3
D11538	CARRIER COMMAND POST: LT TRACKED	0
D11538 *		0
D11538 *		0
D11538 *		0
D99573	CHARGER BATTERY: PP-34/MSM	1
E00533	CHARGER RADIAC DETECT	5
E36896	CMBT VEH ANTI TANK: IMP TOM W/O TOM MPN SYS	0
E63728	COMPASS MAGNETIC UNMTD	16
E70064	COMP UNIT RCP TRK 2 WHL PNEU TIRE GAS DRVN	1
E98103	ELEC TRANSFER KEY KYK-13/TSEC	3
F55553	DISTRIBUTION SYS ELEC 120V 1PH 60AMP	1
G11966	GEN SET DED SKID MTD 5KW 60HZ	1
G18358	GEN SET DED SKID MTD 3KW	1
H25866	HEATER RATION INDIV: MTD TRPS	18
J31297	INST KIT MK-2195/VRC-87/88/90 2 1/2 5 TON	1
J31569	INSTL KIT 87.88,90 HHMW	1
J47151	INST KIT 87.88,89 H987,984,988	0
J47457	INSTL KIT 89.91,92 HHMW	7
J87848	INSTL KIT MK-2499/VRC FOR TSEC/KY-57 WITH SINCS	0
K23814	HEADSET-MICROPHONE: H-182/PT	12
L44595	LAUNCHER GRENADE 40MM: SBL SHOT RIFLE MTD DTCH	0
L44748	LAUNCHER GRENADE ARMAMENT SUBSYSTEM	0
L63994	LIGHT SET GEN ILLUM 25 OUTLET	2
L67021	LAUNCHER GRENADE SMOKE	0
L91975	MACHINE GUN CALIBER .50	13
L92386	MACHINE GUN 7.62MM	1
M09009	MACHINE GUN 5.56MM	4
M12418	MASK CBR M40	104
M14381	MASK AG-903/B	8
M18526	MASK CBR CMBT VEH M42	0
M60449	MULTIMETER DIGITAL AM/PSM-45	4
M68405	MORTAR 120 MM	12
M68405 *		12
M74364	MOUNT GUN RING CAL .50	1
M75577	MOUNT TRIPOD MACH GUN HUY CAL .50	13
M75714	MOUNT TRIPOD MACH GUN 7.62 MM	5
M02758	NET CONTROL DEVICE	4

TABLE H-8 (CON'T)

N04596	NIGHT VISION SIGHT CREW SERVED WEAPON AM/TVS-5	13
N04732	NIGHT VISION SIGHT INDIV SERVD WPN AM/PVS-4	9
N05050	NIGHT VISION SIGHT SET AM/UAS-11	0
N05482	NIGHT VISION GOOGLES AM/PVS-7B	61
P07900	PLOTTING BOARD INDIRECT FIRE AZIMUTH	20
P40750	POWER SUPPLY PP-6224/U	4
P70517	PURGING KIT FIRE CONTROL: ORG MAINT	1
P98152	PISTOL 9MM AUTOMATIC: M9	15
Q20935	RADIAC METER IM-93/UD	8
R20684	RADIAC SET AM/VDR-2	5
R30895	RADIO SET AM/8RC 213	0
R30925	RADIAC SET AM/PDR-75	1
R67194	RADIO SET AM/VRC-87A	8
R67194	RADIO SET AM/VRC-88A	12
R68010	RADIO SET AM/VRC-91A	0
R67908	RADIO SET AM/VRC-90A	3
R45339	RADIO SET AM/VRC-92	12
R55268	RADIO SET AM/PRC-119	3
R56742	REEL EQUIPMENT CE-11	5
R59160	REELING MACHINE CABLE	9
R93169	RADIO TEST SET AM/PRM-34	1
R95035	RIFLE 5.56 MM M16A2	89
R97234	RIFLE 5.56 MM M4	0
S01373	SPEECH SECURITY EQUIP TSEC/KY-57	1
T07679	TRK UTIL HVY VARIANT HMMV	12
T25726	TONE-SIGNALING ADAPTER TA-977	1
T39518	TRK CGO TACT 8X8 HEMMT W/W W/LT CRANE	3
T40405	TAPE READER GP KD1-18/TSEC	2
T45593	SIGHT BORE OPTICAL	4
T61494	TRUCK UTIL: CGO/TRP M998 HMMV	8
T63093	TRUCK WRKR TAC 8X8 HEMMT W/W W/LT CRANE	0
T87243	TRUCK TANK FUEL SVC6 2500 GAL HEMMT	0
T87243 *		0
T92242	TRK UTIL ARMT CARRIER HMMV	12
U82529	SWITCHBOARD TELEPHONE MANUAL: SB-993/8T	4
U81707	SWITCHBOARD TELEPHONE MANUAL: SB-22/PT	1
U89185	UTILITY RECEPTACLE	1
V31211	TELEPHONE SET TA312	26
V98788	POWER SUPPLY VEN HYP-57/TSEC	2
W32593	SHOP EQUIP AUTO MAINT	1
W32867		1
W65747	TOOL SET VEH FULL TRACKED	1
W95537	TLR CGO 3/4 TON 2 WNL W/E	0
W95537 *		0
W95811	TLR CGO 1 1/2T M105	0
W95811 *		0
W98825	TLR TANK WATER 400 GAL M149A2	1
X40794	TRUCK CARGO DROP SIDE 6X6 W/E M923A1	0
X40831	TRUCK CARGO 5 TON 6X6 LWB W/E	0
Z40430	TRUCK CGO LMTV W/E	4
Z09000	LOGNARS(T) COMM NODEN GRP	1
Z25291	ELECTRONIC NOTEBOOK (EN): AM/CYZ-7	22

TABLE H-8 (CON'T)

228175	GM SYS FIBER OPTICS-IT: NLOS-CA	0
228175*		0
232890	HEATER DUCT TYPE PTBL	1
232890 *		1
236068	TRLR CGO LNTV W/DROPSIDES	3
236272	TRLR CGO HIGH MOBILITY	1
237833	TRMR MISSLE ASMBLY MASS SIM	0
243350	MISSLE GUIDED FIBER OPTICS	0
250144	LOGMARS(IT) MICROPRO GRP	1
262381	RECOVERY VEHICLE FULL TRACKED	0
262381 *		1
262381 *		1
262381 *		1
262381 *		1
262381 *		1
267950	MOUNT TRIPOD MACH GUN XM192	1
294047	TRUCK TANK POL NTV W/E	1
294047 *		1
294433	TRUCK WRECKER MTV W/W W/E	1
295931	VEHICLE POWER CONDITIONER (VPC)	1

TABLE H-9

UNIT MANPOWER REQUIREMENTS NLOS-CA CO HEAVY DIVISION FOG-M

MOS	DTOE	PROJECTED	DELTA	MLOS CO FOGM HWY GRADE
	NLOS CO FOGM HWY	NLOS CO FOGM HWY	DTOE VS PROJECTED	
11A00	0.00	0.00	0.00	0.00 05
11A00	0.00	0.00	0.00	0.00 04
11A00	1.00	1.00	0.00	1.00 03
11A00	4.00	4.00	0.00	4.00 02
11H5M	1.00	1.00	0.00	1.00 E8
11H40	4.00	4.00	0.00	4.00 E7
11H30	7.00	4.00	-3.00	4.00 E6
11H20	6.00	9.00	3.00	9.00 E5
11H10	12.00	14.00	2.00	14.00 E4
11H10	11.00	9.00	-2.00	9.00 E3
24N10	0.00	1.00	1.00	1.00 E4
24N10	0.00	0.00	0.00	0.00 E3
31U30	0.00	0.00	0.00	0.00 E6
31U20	1.00	0.00	-1.00	0.00 E5
31U10	0.00	1.00	1.00	1.00 E4
52D10	0.00	1.00	1.00	1.00 E4
54B20	1.00	1.00	0.00	1.00 E5
54B10	0.00	0.00	0.00	0.00 E4
63B20	0.00	1.00	1.00	1.00 E5
63B10	0.00	0.00	0.00	0.00 E4
63B10	0.00	1.00	1.00	1.00 E3
63J20	0.00	0.00	0.00	0.00 E5
63J10	0.00	1.00	1.00	1.00 E4
63J10	0.00	0.00	0.00	0.00 E3
63S20	0.00	0.00	0.00	0.00 E5
63S10	0.00	1.00	1.00	1.00 E4
63S10	0.00	0.00	0.00	0.00 E3
77F20	0.00	0.00	0.00	0.00 E5
77F10	1.00	1.00	0.00	1.00 E4
77F10	1.00	1.00	0.00	1.00 E3
88M30	0.00	0.00	0.00	0.00 E6
88M20	1.00	1.00	0.00	1.00 E5
88M10	2.00	1.00	-1.00	1.00 E4
88M10	2.00	0.00	-2.00	0.00 E3
92A10	0.00	0.00	0.00	0.00 E4
92A10	0.00	1.00	1.00	1.00 E3
92Y30	0.00	0.00	0.00	0.00 E6
92Y20	1.00	1.00	0.00	1.00 E5
92Y10	1.00	1.00	0.00	1.00 E4
92Y10	0.00	0.00	0.00	0.00 E3
OFFICER	5.00	5.00	0.00	5.00
WARRANT	0.00	0.00	0.00	0.00
ENLISTED	52.00	56.00	4.00	56.00
TOTAL	57.00	61.00	4.00	61.00

TABLE H-10

MANPOWER REQUIREMENTS FOR MOSC 63B, 63S, 92A ARE DISPLAYED TO SHOW WHOLE MANPOWER MAINTENANCE DEMAND IF ORGANIC VEHICLES ARE MAINTAINED AT THE UNIT LEVEL.

MANPOWER REQUIREMENTS FOR WHEELED VEHICLE MAINTENANCE IF PERFORMED AT A SUPPORTING ORGANIZATIONAL MAINTENANCE COMPANY

MOS	MANPOWER REQUIREMENTS
63B	1.56 FRACTIONAL BASED ON TOTAL WORKLOAD
63S	0.43 FRACTIONAL BASED ON TOTAL WORKLOAD
92A	1.00

FRACTIONAL MANPOWER REQUIREMENTS FOR DS AND GS MAINT DEMAND
DS MAINT MPR REQ

27U	0.59139
29E	0.06378
29N	0.01076
29J	0.00753
29S	0.00036
35H	0.03682
39E	0.07364
45B	0.03562
52D	0.03368
63J	0.02510
63W	2.04328

GS MAINT MPR REQ

27U	0.09156
29E	0.01430
29N	0.00170
29S67	0.00017
35H	0.06668
39B	0.00057
39E	0.00828
45B	0.00363
52D	0.01889
63J	0.00692
63W	0.66400

TABLE H-11

11H POSITIONS BY PARAGRAPH DTOE

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTAL
101	HQ SECTION	1	1	1	0	2	0	5
104	PLATOON HQ		3	0	0	0	9	12
105	NLOS SECTIONS		0	6	6	12	0	24
	NLOS CO TOTAL	1	4	7	6	14	9	41

11H POSITIONS BY PARAGRAPH PROJECTED

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTAL
101	HQ SECTION	1	1	1	0	2	0	5
104	PLATOON HQ		3	0	0	0	9	12
105	NLOS SECTIONS		0	3	9	12	0	24
	NLOS CO TOTAL	1	4	4	9	14	9	41
	NLOS CO TOTAL	1	4	4	9	14	9	41
	NON SYSTEM DRIVEN	1	4	1	0	2	9	17
	SYSTEM DRIVEN	0	0	3	9	12	0	24

TABLE M-12

EQUIPMENT SECTION MLOS-CA CO HEAVY DIVISION FOB-M

LIN	NOMENCLATURE	NEW REQ
A32335	ALARM CHEN AGENT	4
A79381	ANTENNA GROUP DE-254(1)/GRC	5
C05541	CONTROL REC TRANS: C-11561(C)/U	2
C05701	MONITOR CHEN AGENT	2
C62375	BATTERY CASE: Z-AIJ-EI	12
E00533	CHARGER RADIAC DETECT	4
E98103	ELEC TRANSFER KEY KYK-13/TSEC	1
G18358	GEN SET DED SKID MTD 3KW	1
J31297	INST KIT MK-2195/VRC-87/88/90 2 1/2 5 TON	1
J31569	INSTL KIT 87,88,90 HMMWV	13
J47151	INST KIT 87,88,89 M987,984,988	0
J47457	INSTL KIT 89,91,92 HMMWV	16
L92386	MACHINE GUN 7.62MM	2
M12418	MASK CBR	56
M75714	MOUNT TRIPOD	2
N02758	NET CONTROL DEVICE	2
N04732	NIGHT VISION GOGGLES AN/PVS-4	2
N05482	NIGHT VISION GOGGLES AN/PVS-7B	45
P98152	PISTOL 9MM AUTOMATIC: M9	13
Q20935	RADIACMETER IN-93/UD	
R20684	RADIAC SET AN/VDR-2	4
R30895	RADIO SET AN/GRC 213	0
R30923	RADIAC SET AN/PDR-75	1
R44659	RADIO SET AN/VRC-87	0
R67194	RADIO SET AN/VRC-88A	12
R68010	RADIO SET AN/VRC-91A	3
R67908	RADIO SET AN/VRC-90A	2
R45407	RADIO SET AN/VRC-92A	1
R56742	REEL EQUIPMENT CE-11	15
R59160	REELING MACHINE CABLE	8
R95035	RIFLE 5.56 MM M16A2	56
R97234	RIFLE 5.56 MM M4	0
T07679	TRK UTIL HVY VARIANT HMMWV	12
T39518	TRK CGO TACT 8X8 HEMMT W/W W/LT CRANE	3
T40405	TAPE READER SP K01-18/TSEC	1
T61494	TRUCK UTIL: CGO/TRP M998 HMMWV	5
T63093	TRUCK WRKR TAC 8X8 HEMMT W/W W/LT CRANE	1
T87243	TRUCK TANK FUEL SVCS 2500 GAL HEMMT	1
T87243 *		1
T92242	TRK UTIL ARMT CARRIER HMMWV	12
V31211	TELEPHONE SET TA312	6
W95811	TRLR CGO 1 1/2T M105	0
W95811 *		
W98825	TRLR TANK WATER 400 GAL M149A2	1
X40794	TRUCK CARGO DROP SIDE 6X6 W/E M923A1	0
X40831	TRUCK CARGO 5 TON 6X6 LWB W/E	0
Z40430	TRUCK CGO LMTV W/E	1
Z25291	ELECTRONIC NOTEBOOK (EN): AN/CYZ-7	18
Z28175	GM SYS FIBER OPTICS-IT: MLOS-CA	12
Z28175*		12
Z37833	TRMR MISSILE ASMBLY MASS SIM	72
Z43350	MISSILE GUIDED FIBER OPTICS	12
Z95931	VEHICLE POWER CONDITIONER (VPC)	12

TABLE H-13

UNIT MANPOWER REQUIREMENTS NLOS-CA CO LIGHT DIVISION FOG-N

	DTOE NLOS CO FOGM LT	PROJECTED NLOS CO FOGM LT	DELTA DTOE VS PROJECTED	NLOS CO FOGM LT GRADE
NOS				
11A00	0.00	0.00	0.00	0.00 03
11A00	0.00	0.00	0.00	0.00 04
11A00	1.00	1.00	0.00	1.00 03
11A00	4.00	4.00	0.00	4.00 02
11H5H	1.00	1.00	0.00	1.00 E8
11H4D	4.00	4.00	0.00	4.00 E7
11H3D	7.00	4.00	-3.00	4.00 E6
11H2D	6.00	9.00	3.00	9.00 E5
11H1D	12.00	14.00	2.00	14.00 E4
11H1D	11.00	9.00	-2.00	9.00 E3
24N1D	0.00	1.00	1.00	1.00 E4
24N1D	0.00	0.00	0.00	0.00 E3
31U3D	0.00	0.00	0.00	0.00 E6
31U2D	1.00	0.00	-1.00	0.00 E3
31U1D	0.00	1.00	1.00	1.00 E4
52D1D	0.00	1.00	1.00	1.00 E4
54B2D	1.00	1.00	0.00	1.00 E5
54B1D	0.00	0.00	0.00	0.00 E4
63B2D	0.00	1.00	1.00	1.00 E5
63B1D	0.00	0.00	0.00	0.00 E4
63B1D	0.00	1.00	1.00	1.00 E3
63J2D	0.00	0.00	0.00	0.00 E5
63J1D	0.00	1.00	1.00	1.00 E4
63J1D	0.00	0.00	0.00	0.00 E3
63S2D	0.00	0.00	0.00	0.00 E5
63S1D	0.00	1.00	1.00	1.00 E4
63S1D	0.00	0.00	0.00	0.00 E3
77F2D	0.00	0.00	0.00	0.00 E5
77F1D	1.00	0.00	-1.00	0.00 E4
77F1D	1.00	1.00	0.00	1.00 E3
88M3D	0.00	0.00	0.00	0.00 E6
88M2D	1.00	1.00	0.00	1.00 E5
88M1D	2.00	1.00	-1.00	1.00 E4
88M1D	2.00	0.00	-2.00	0.00 E3
92A1D	0.00	0.00	0.00	0.00 E4
92A1D	0.00	1.00	1.00	1.00 E3
92Y3D	0.00	0.00	0.00	0.00 E6
92Y2D	1.00	1.00	0.00	1.00 E5
92Y1D	1.00	1.00	0.00	1.00 E4
92Y1D	0.00	0.00	0.00	0.00 E3
OFFICER	5.00	5.00	0.00	5.00
WARRANT	0.00	0.00	0.00	0.00
ENLISTED	52.00	55.00	3.00	55.00
TOTAL	57.00	60.00	3.00	60.00

TABLE H-14

MANPOWER REQUIREMENTS FOR MOSC 63B, 63S, 92A ARE DISPLAYED TO SHOW WHOLE MANPOWER MAINTENANCE DEMAND IF ORGANIC VEHICLES ARE MAINTAINED AT THE UNIT LEVEL.

MANPOWER REQUIREMENTS FOR WHEELED VEHICLE MAINTENANCE IF PERFORMED AT A SUPPORTING ORGANIZATIONAL MAINTENANCE COMPANY

MOS	MANPOWER REQUIREMENTS
63B	1.56 FRACTIONAL BASED ON TOTAL WORKLOAD
63S	0.43 FRACTIONAL BASED ON TOTAL WORKLOAD
92A	1.00

FRACTIONAL MANPOWER REQUIREMENTS FOR DS AND GS MAINT DEMAND
DS MAINT MPR REQ

27U	0.59139
29E	0.06378
29N	0.01076
29J	0.00753
29S	0.00036
35H	0.03682
39E	0.07364
45B	0.03562
52D	0.03368
63J	0.02510
63M	2.04328

GS MAINT MPR REQ

27U	0.09156
29E	0.01430
29N	0.00170
29S67	0.00017
35H	0.06668
39B	0.00057
39E	0.00828
45B	0.00363
52D	0.01889
63J	0.00692
63M	0.66400

TABLE H-15

11H POSITIONS BY PARAGRAPH DTCE

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTA
101	HQ SECTION	1	1	1	0	2	0	5
104	PLATOON HQ		3	0	0	0	9	12
105	NLOS SECTIONS		0	6	6	12	0	24
	NLOS CO TOTAL	1	4	7	6	14	9	41

11H POSITIONS BY PARAGRAPH PROJECTED

PARA	FUNCTIONAL AREA	E8	E7	E6	E5	E4	E3	TOTA
101	HQ SECTION	1	1	1	0	2	0	5
104	PLATOON HQ		3	0	0	0	9	12
105	NLOS SECTIONS		0	3	9	12	0	24
	NLOS CO TOTAL	1	4	4	9	14	9	41
	NLOS CO TOTAL	1	4	4	9	14	9	41
	NON SYSTEM DRIVEN	1	4	1	0	2	9	17
	SYSTEM DRIVEN	0	0	3	9	12	0	24

TABLE H-16

EQUIPMENT SECTION NLOS-CA CO LIGHT DIVISION FOB-M

LIN	NOMENCLATURE	MEM REQ
A32355	ALARM CHEN AGENT	4
A79381	ANTENNA GROUP DE-254(1)/BRC	5
C05541	CONTROL REC TRANS: C-11561(C)/U	2
C05701	MONITOR CHEN AGENT	2
C62375	BATTERY CASE: Z-AIJ-EI	12
E00533	CHARGER RADIAC DETECT	4
E98103	ELEC TRANSFER KEY KYK-13/TSEC	1
618358	GEN SET DEB SKID MTD 3KW	1
J31297	INST KIT MK-2195/VRC-87/88/90 2 1/2 5 TON	1
J31569	INSTL KIT 87.88.90 HMMWV	13
J47151	INST KIT 87.88.89 M987,984,988	0
J47457	INSTL KIT 89.91.92 HMMWV	16
L92386	MACHINE GUN 7.62MM	2
M12418	MASK CBR	56
M75714	MOUNT TRIPOD	2
N02758	NET CONTROL DEVICE	2
N04732	NIGHT VISION GOGGLES AM/PVS-4	2
N05482	NIGHT VISION GOGGLES AM/PVS-7B	45
P98152	PISTOL 9MM AUTOMATIC: M9	13
Q20935	RADIACMETER IN-93/UD	
R20684	RADIAC SET AM/VDR-2	4
R30895	RADIO SET AM/BRC 213	0
R30925	RADIAC SET AM/PDR-75	1
R44659	RADIO SET AM/VRC-87	0
R67194	RADIO SET AM/VRC-88A	12
R68010	RADIO SET AM/VRC-91A	3
R67908	RADIO SET AM/VRC-90A	2
R45407	RADIO SET AM/VRC-92A	1
R56742	REEL EQUIPMENT CE-11	15
R59160	REELING MACHINE CABLE	8
R95035	RIFLE 5.56 MM M16A2	56
R97234	RIFLE 5.56 MM M4	0
T07679	TRK UTIL Hvy VARIANT HMMWV	12
T39518	TRK CGO TACT 8X8 HEWIT M/M M/LT CRANE	3
T40405	TAPE READER 6P K01-18/TSEC	1
T61494	TRUCK UTIL: CGO/TRP M998 HMMWV	5
T63093	TRUCK WRKR TAC 8X8 HEWIT M/M M/LT CRANE	1
T87243	TRUCK TANK FUEL SVCS 2500 GAL HEWIT	1
T87243 *		1
T92242	TRK UTIL ARMT CARRIER HMMWV	12
V31211	TELEPHONE SET TAS12	6
W95811	TLR CGO 1 1/2T M105	0
W95811 *		
W98825	TLR TANK WATER 400 GAL M149A2	1
X40794	TRUCK CARGO DROP SIDE 6X6 M/E M923A1	0
X40831	TRUCK CARGO 5 TON 6X6 LMB M/E	0
X40430	TRUCK CGO LHTV M/E	1
Z25291	ELECTRONIC NOTEBOOK (EN): AM/CYZ-7	18
Z28175	GM SYS FIBER OPTICS-IT: NLOS-CA	12
Z28175*		12
Z37833	TMR MISSILE ASMBLY MASS SIM	72
Z43350	MISSILE GUIDED FIBER OPTICS	12
Z95931	VEHICLE POWER CONDITIONER (VPC)	12

APPENDIX I
NLOS-CA PERSONNEL ASSESSMENT

1.0 PERSONNEL ASSESSMENT.

As a part of the Manpower/Personnel Analysis effort, the AEPCO/DRC team was asked to provide a high level assessment of the whether or not MOS 11H has the physical attributes and the prerequisite skills and knowledge to learn to operate the NLOS-CA console.

1.1 SCOPE. The assessment was limited to the NLOS-CA console operation and was based upon the information available from the Target Audience Description (TAD) for MOS 11H and 96H.

1.2 ASSUMPTIONS.

MOS 11H will be the NLOS-CA operator;

MOS 96H performs tasks similar to those required for operation of the NLOS-CA console;

The current TADs for MOS 11H and 96H are accurate; and

The NLOS-CA console will include full color displays.

1.3 RESULTS. Based upon the comparison of the 11H and the 96H MOS it appears that there is some risk in assuming that the current soldier in MOS 11H can operate the NLOS-CA console. The risk is primarily associated with MOS 11H having the vision requirement for red/green discrimination rather than normal color vision and to a lesser degree the ASVAB requirements. Figure 1.3-1 is a graphical representation of the relationship between the MOSs based upon the personnel predictors that were selected to be used in this assessment. The Y Axis shows the weighted value for the MOSs for each predictor. The utility of this graph is not to determine the score of the MOSs, but to show the difference between them. The differences indicate those predictors where the analyst determined that the higher scoring MOS is more likely to meet or exceed the evaluation criteria. The overall score for each MOS is a computation of the predictor's score for each MOS based upon the weighted value of each predictor. A more in depth discussion of the evaluation of each predictor is provided at Attachment 1.

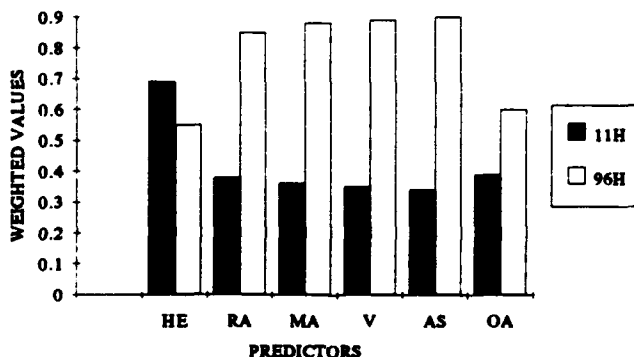


FIGURE 1.3-1 COMPARISON OF PERSONNEL SUPPORT REQUIREMENTS BETWEEN 11H AND 96H MOS

HE - HAND EYE COORDINATION
 RA - READING ABILITY
 MA - MATH ABILITY
 V - VISION
 AS - ANALYTICAL SKILLS
 OA - OVERALL SCORE

1.4 METHODOLOGY.

The assessment was conducted using the Analytical Hierarchy Process (AHP) which is discussed at Appendix G of this report. The Expert Choice (TM) software was used to implement and document the AHP. First the analyst identified the personnel predictors for the operation of the NLOS-CA console; then the analyst selected the criteria from the TAD that would be used to evaluate the relative importance of each predictor; next the analyst executed the Expert Choice (TM) model; and finally, the analyst conducted sensitivity analyses.

1.4.1 Personnel Predictors. The 11H MOS does not currently train specific tasks that are envisioned for the operation of the NLOS-CA console (i.e. controlling the flight of a missile). Therefore, the analyst selected the 96H MOS (Aerial Intelligence Specialist) as a base case for selecting and assessing the personnel predictors. The analyst reviewed the tasks trained for the 96H and selected those that are similar to the tasks required for the operation of the NLOS-CA console. These tasks may be found at Attachment 1. The analyst then determined the predictors for the tasks. The selection of the predictors was based upon DRC's training analysts experience in conducting training analyses and designing and developing Army training courses. Table 1.4-1 shows the personnel predictors and the reason why each criterion was selected.

TABLE 1.4-1 PERSONNEL PREDICTORS

PREDICTOR	REASON
HAND/EYE COORDINATION	Necessary to simultaneously observe video display and adjust missile flight path
READING ABILITY	Necessary to read operating manuals and information on display screen
MATHEMATICAL ABILITY	Necessary to interpret information on display screen
VISION	Necessary to distinguish between display screen colors and observe video display
ANALYTICAL SKILLS	Necessary to determine the correct flight path for the missile and select targets

The analyst then determined the relative importance of each predictor, when compared to the other predictors, for the operation of the NLOS-CA console. This determination resulted in a weighted value for each predictor indicating its calculated relative importance. The predictors and their relative weighted importance are shown at Table 1.4-2.

TABLE 1.4-2 PERSONNEL PREDICTORS AND WEIGHTED VALUES

HE COORD	READ ABL	MATH ABL	VISION	ANAL SKL
G 0.408	G 0.145	G 0.051	G 0.340	G 0.055

HE COORD --- Hand Eye Coordination

READ ABL --- Reading Ability

MATH ABL --- Mathematical Ability

VISION --- Visual Acuity (VA)/Normal Color (NC) Vision

ANAL SKL --- Analytical Skills

G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO OVERALL TRAINABILITY OF MOS

1.4.2 Evaluation Criteria. Once the personnel predictors were selected, the analyst then determined the criteria for assessing each predictor. All of the criteria were selected from the TAD. The criteria selected and the reason for their selection is shown at Table 1.4-3.

TABLE 1.4-3 EVALUATION CRITERIA

EVALUATION CRITERION	REASON SELECTED
AFQT	Provides Mental Categories and demonstrates abstract thinking
ASVAB	Provides Test Components
EDU LVL	Provides High School and Non-High School Graduates
READING LVL	Provides Reading Grade Level Categories
PULHES	Provides Physical Profile Serials

AFQT - The Armed Forces Qualification Test

ASVAB - Armed Services Vocational Aptitude Battery

EDU LVL - Education Level

READING LVL - Reading Level

PULHES - P-Physical Capacity or Stamina U-Upper Extremities L-Lower Extremities H-Hearing and Ear/ E-Eyes/ S-Psychiatric

The analyst then determined the relative importance of each criterion, when compared to the other criteria, for each predictor. This determination resulted in a weighted value being calculated for each evaluation criterion indicating its impact on each predictor. A weighted value was also calculated for each criterion indicating its impact on the operation of the NLOS-CA console. Table 1.4-4 shows the personnel predictors and their relative weighted values, the percentage of impact for each evaluation criterion on its predictor, and the percentage of impact of each evaluation criteria on the overall assessment.

TABLE 1.4-4 EVALUATION CRITERIA AND WEIGHTED IMPORTANCE

HE COORD G 0.408	READ ABL G 0.145	MATH ABL G 0.051	VISION G 0.340	ANAL SKL G 0.055
AFQT L 0.167 G 0.068	READ LVL L 0.833 G 0.121	ASVAB L 0.750 G 0.038	NC L 0.750 G 0.255	AFQT L 0.163 G 0.009
PULHES L 0.833 G 0.340	EDU LVL L 0.167 G 0.024	EDU LVL L 0.250 G 0.013	V/ACUTTY L 0.250 G 0.085	ASVAB L 0.540 G 0.030 EDU LVL L 0.297 G 0.016

- L --- LOCAL PRIORITY: PRIORITY RELATIVE TO THE IMPORTANCE OF
EVALUATION CRITERIA TO THE TRAINABILITY PREDICTOR
- G --- GLOBAL PRIORITY: PRIORITY RELATIVE TO OVERALL TRAINABILITY OF
MOS

1.4.3 Model Execution and Analysis. After the evaluation criterion for each personnel predictor was established, the Expert Choice (TM) model was executed and a comparison of the two MOSs was produced. Once the ranking of the MOSs was established, the analyst then conducted a series of analyses to determine the sensitivity of results to changes in input criterion.

1.5 SENSITIVITY ANALYSIS. A sensitivity analysis was conducted by changing one or more of the evaluation criteria to determine its impact on the ranking of the alternatives.

1.5.1 Sensitivity Analysis Methodology. In order for the analyst to evaluate the impacts of varying the evaluation criteria, it important to determine the impacts of changing each evaluation criterion separately; the impacts of changing two of the evaluation criteria together; and finally the impacts of changing all of the evaluation criteria together. Table 1.5-1 shows the Evaluation Criteria and the reason they were selected for the analysis.

TABLE 1.5-1 EVALUATION CRITERIA SELECTED FOR SENSITIVITY ANALYSIS

EVALUATION CRITERION	REASON SELECTED
COLOR VISION	Critical for Interpreting Displays
VISUAL ACUTY	Necessary for HE Coord and Viewing Display
ASVAB TEST	Identifies Knowledge necessary for controlling missile flight

A discussion of the sensitivity analysis procedure and an evaluation of the results is provided at Attachment 1. The results of the analysis are shown at Table 1.5-2 and discussed in subparagraphs 1.5.1.1 through 1.5.1.7.

TABLE 1.5-2 EVALUATION CRITERIA IMPACTS

EVAL CRIT	OVERALL IMPACT*
NC	-.13 Points
VA	-.04 Points
NC/VA	-.15 Points
ASVAB	-.04 Points
ASVAB/VA	-.08 Points
ASVAB/VA/NC	-.19 Points

*At the start of the sensitivity analysis, the difference between the two MOSs was 21 points

1.5.1.1 Color Vision. Making normal color vision a requirement for soldiers in MOS 11H will reduce the overall difference between the 96H and 11H MOS by .13 points.

1.5.1.2 Visual Acuity. Making the PULHES physical serial profile requirement a 1 for eyes for soldiers in MOS 11H will reduce the overall difference between the 96H and 11H MOS by only .04 points.

1.5.1.3 Color Vision and Visual Acuity. If these two attributes are combined the overall difference between the 11H and 96H MOS is reduced by .15 points.

1.5.1.4 ASVAB Test. If the soldiers in the 11H MOS were required to have a secondary ASVAB test of ST this would reduce the overall difference between the 96H and 11H MOS by only .04 points.

1.5.1.5 ASVAB Test and Color Vision. If the soldiers in MOS 11H were required to have a secondary ASVAB of ST and normal color vision the difference between the 96H and 11H MOS is reduced by .16 points.

1.5.1.6 ASVAB Test and Visual Acuity. If the soldiers in MOS 11H were required to have a secondary ASVAB of ST and a PULHES physical serial profile requirement of 1 for eyes the difference between the 96H and 11H MOS is reduced by .08 points.

1.5.1.7 ASVAB Tests, Normal Color, and Visual Acuity. If the three evaluation criteria were combined the overall difference between the 96H and 11H MOS is reduced by .19 points.

1.5.2 Sensitivity Analysis Evaluation. Once the impacts of the changing the three evaluation criteria were determined the analyst assessed the level of the impact on

personnel qualifications and the system requirements. The impacts were assigned to one of three levels, low, medium, and high. A low level impact means that the change could be implemented with little or no disruption of the current personnel procurement system or restrictions/constraints being place upon the system design process. A medium level impact means that implementing the change could limit the current personnel procurement process or place some constraints on the system design process. A high level impact is a "show stopper", it could severely restrict the personnel procurement process or eliminate most system design alternatives. Table 1.5-3 is a matrix that shows how each of the evaluation criteria, shown at Table 1.5-1, impacts the overall difference between the 11H and 96H MOS. A discussion of the impacts of changing the normal color vision, visual acuity, and ASVAB evaluation criteria are provided in subparagraphs 1.5.2.1 through 1.5.2.3.

TABLE 1.5-3 PERSONNEL ASSESSMENT IMPACTS

EVAL CRIT	PERSONNEL QUALIFICATIONS	SYSTEM REQUIREMENTS
NC	L	M
VA	L/M	N/A
NC/VA	L/M	M
ASVAB	M	N/A
ASVAB/VA	L/M	N/A
ASVAB/VA/NC	M	M

Impact Categories (AS determined by DRC SMEs)

L = Low

M = Medium

N/A = Non-Applicable

1.5.2.1 Normal Color. The largest single benefit can be attained from requiring the soldiers in MOS 11H to have normal color vision. A low impact was assigned to this option based upon research that indicates that less than 3% of the United States (US) male population is color blind. This information was obtained from Field Circular (FC) 21-451, I Am the American Soldier, dated 31 March 1985. This would indicate the 11H personnel recruitment pool would be reduced by only 3%. The same impact can be achieved by designing the NLOS-CA displays so they can be interpreted by a soldier who is color blind. While this will provide a system that can be operated by 100% of the soldiers it may place costly and undue restrictions on the design of the displays when a maximum of 3% of the soldiers need this type of display. It should be noted that the 11H MOS may contain a larger percentage of color blind soldiers than the general population. This is due to the fact that if person is otherwise qualified for military service then he would be placed in an MOS that did not require normal color vision. However, due to the small percentage of color blind males in the US this number would still be relatively small.

1.5.2.2 Visual Acuity. A low to medium impact was assigned to changing this evaluation criteria because according to FC 21-451, 32% of the US male population

between the ages of 18-25 need corrective lenses. While not all of these people would fall below the visual acuity requirements for training on the NLOS-CA console it can be assumed that a certain percentage could not be correctable to within the normal vision range. This could adversely impact upon the 11H personnel recruitment pool.

1.5.2.3 ASVAB. A medium impact was assigned to this evaluation criteria based upon information available from data extracted from the Project A database. Project A was a major R&D effort undertaken by the Army Research Institute during the mid-1980s. Although this study is dated, it appears to be the "best accessible data" and is currently being used for other government studies. Data was not available on the 11H MOS but, there was accurate information on the 11B MOS. Since both these MOSs are from the same Consolidated Management Filed (11) and have same ASVAB test requirement (CO) and cutoff score (90), it was assumed by the analyst that the information available for the 11B for ASVAB test ST would be similar to the 11H. Based upon this data 16% of the soldiers scored below a cutoff score of 90 for the ST test. This could have an serious impact on the 11H personnel recruitment pool.

1.6 RECOMMENDATIONS. Based upon the personnel assessment and evaluation of the results it is recommended that the visual requirements for the soldiers in MOS 11H be changed from red/green discrimination to normal color vision. As shown at Table 5.1-3, making this change would result in the most benefit and have the least impact on the personnel requirements and no impact on the system design process.

**ATTACHMENT 1
TO
APPENDIX I**

SECTION I
TECHNICAL DETAILS OF ANALYSIS

II-1.0 OVERVIEW. At the NLOS-CA Delivery Order Initiation Meeting, the Government requested that a high level assessment be made to determine if MOS 11H had the prerequisite skills and knowledge to operate the NLOS-CA console. It was agreed that the analysis would be conducted with the information available from the Target Audience Description (TAD).

II-1.0 Personnel Predictor. The 11H MOS does not currently train specific tasks that are envisioned for the operation of the NLOS-CA console (i.e. controlling the flight of a missile). Therefore, the analyst selected the 96H MOS (Aerial Intelligence Specialist) as a baseline for selecting and assessing the personnel predictors. The analyst reviewed the tasks trained for the 96H and selected those that are similar to the tasks required for the operation of the NLOS-CA console. The analyst then converted these tasks to notional NLOS-CA operator tasks. These tasks are shown at Table II-1-1.

TABLE II-1-1 96H AND 11H TASK

96H Tasks*	11H Tasks**
Performs preflight, preoperation, operator, and unit maintenance on assigned sensor SERE and associated equipment.	Performs preoperation operation checks on NLOS-CA console and launcher.
Troubleshoots sensor and associated systems to determine nature and location of fault occurrence.	Performs BIT/BITE on NLOS-CA console, launcher, and associated systems to determine nature and location of fault occurrence.
Records operation and maintenance data in equipment log for support maintenance services.	Records operation and maintenance data in equipment log for support maintenance services.
Performs aerial missions using visual acquisition skills and the operation of manned aerial infrared, radar, photographic, or similar sensor systems, including associated data transmission links and ground data terminal stations.	Performs aerial missions using visual acquisition skills and the operation the NLOS-CA console.
Visually acquires targets, or interprets target signatures appearing on near real time sensor system displays and renders inflight spot reports on targets of opportunity.	Visually acquires targets, or interprets target signatures appearing on near real time system displays.
Recognizes enemy electronic countermeasures directed against aircraft or ground component communications or sensor system equipment and performs applicable ECCM.	Recognizes enemy countermeasures directed against missile or video equipment and performs applicable ECCM.

*Based upon March 1993 TAD.

**Tasks developed by comparability analysis.

I1-2 RESULTS. A discussion of results of output from the Expert Choice (TM) model is provided in the following subparagraphs.

I1-2.1 Hand Eye (HE) Coordination. The two key evaluation criteria for this predictor are PULHES and the AFQT. Soldiers in MOS 11H exceed the 96H requirements for the HE Coordination predictor.

I1-2.1.1 PULHES. The two physical attributes from the PULHES that can be used as indicators for determining HE coordination are upper extremities and eyes. Table I1-2-1 is a comparison between these two physical attributes for MOS 11H and 96H.

TABLE I1-2-1 11H AND 96H PULHES

MOS	Upper Extremities	Eyes
11H	1*	2 (RG)**
96H	2*	1 (NC)**

*1- No loss of digits, or limitation of motion
 *2- Slightly limited mobility of joints which does not prevent moderate marching, climbing, running or digging.
 **1- Vision correctable to 20/20 in each eye.
 **2- Distant vision acuity correctable to 20/40-20/70; 20/30-20-100; 20/20-20/400.
 **RG- Must be able to distinguish Red/Green colors
 **NC- Normal color vision

The 11H requirement of a physical profile serial of 1 for upper extremities exceeds the 96H requirement of 2. The 96H requirement of a physical profile serial of 1 for eyes exceeds the 11H requirement of 2. However, a physical profile serial of 2 for vision means that vision must be correctable to within the normal vision range.

I1-2.1.2 AFQT. One of the component tests considered in the computation of the AFQT requires the testee to determine the shape of a "box" based upon an "exploded" diagram. This test demonstrates the soldiers ability to envision the end product resulting from folding the "box" along designated lines. While this test does not directly test hand eye coordination, it does demonstrate that the soldier has the ability to comprehend complex shapes and envision how they are assembled. This is why the AFQT has less importance in determining HE coordination than the PULHES. Table I1-2-2 is a comparison between the AFQT Test Score Categories for MOS 11H and 96H.

TABLE I1-2-2 11H AND 96H AFQT

MOS	CATEGORIES (in %)*			
	I	II	IIIA	IIIB
11H	4.3	34.2	24.4	27.1
96H	10.2	54.5	24.4	8.5

*Based upon March 1993 TAD

In 1993, 62.9% of the soldiers in MOS 11H were in the Test Score Categories I-III compared to 89.1% of the soldiers in MOS 96H. This comparison shows a difference between the two MOS of 26.6 percentage points; if the evaluation includes category IIIB then the difference is only 7.6 percentage points. (11H Cat I-III = 90%; 96H Cat I-III = 97.6%).

I1-2.2 Reading Ability. The key evaluation criterion for this predictor is the Reading Grade Level. Soldiers in MOS 11H are approximately 47% points below those in 96H. Table I1-2-3 is a comparison between the Reading Grade Levels for MOS 11H and 96H.

TABLE I1-2-3 11H AND 96H READING GRADE LEVEL DISTRIBUTION

MOS	READING GRADE LEVELS (in %)*				
	<7	7-9	9-11	11-12	>12
11H	1.6	27.6	19.6	46.2	5.0
96H	0.3	12.2	16.2	59.4	11.9

*Based upon March 1993 TAD

In 1993, 51.2% of the soldiers in MOS 11H had a Reading Grade Level above the 11th grade compared to 71.3% of the soldiers in MOS 96H. While this comparison shows a difference between the two MOS of 20.1 percentage points, if the evaluation is expanded to include the 9-11th grade reading level then the difference is still 16.7 percentage points. (11H Reading Grade Level 9->12 = 70.8%; 96H Reading Grade Level = 87.5%).

I1-2.3 Mathematical Ability. The key evaluation criteria for this predictor are the ASVAB and Education Level. Soldiers in MOS 11H scored approximately 50% point lower than the 96H. Table I1-2-4 is a comparison between the Education Levels for MOS 11H and 96H.

TABLE I1-2-4 11H AND 96H EDUCATION LEVEL DISTRIBUTION

MOS	EDUCATION LEVELS (in %)*	
	HSG	Non-HSG
11H	99.4	0.6
96H	100	0.0

*Based upon March 1993 TAD

In 1993, 99.4% of the soldiers in MOS 11H were high school graduates compared to 100% of the soldiers in MOS 96H. This comparison shows a difference between the two MOSs of only 0.6 of a percentage point.

I1-2.4 Vision. The key evaluation criteria for this predictor are color vision and visual acuity. Soldiers in MOS 11H scored approximately 55% point lower than 96H. Table I1-2-2 shows a comparison of the eyes between MOS 11H and 96H. The primary distinguishing attribute is the requirement for soldiers in MOS 96H to have

normal color vision, while MOS 11H requires that the soldier must be able to distinguish between red and green colors. Since it was assumed that the NLOS-CA console displays would be in color this would seriously impact the trainability of a person without normal color vision.

I1-2.5 Analytical Skills. The three evaluation criteria for this predictor are AFQT, ASVAB, and education level. Soldiers in MOS 11H scored approximately 55% points lower than 96H.

I1-2.5.1 AFQT. As stated in paragraph X.2.1.2, 90% of the 11H soldiers are in AFQT Test Score Categories IIIB-I.

1-I2.5.2 ASVAB. The comparison of the ASVAB is based upon on the component test rather than the Cutoff Score. The ASVAB Test Components for MOS 11H and 96H are shown at Table I1-2-5.

TABLE I1-2.5-5 11H AND 96H ASVAB TEST AND TEST COMPONENTS

MOS	TEST*	TEST COMPONENTS**						
		AR	AS	CS	GS	MC	MK	VE
11H	CO	X	X	X		X		
96H	SC	X	X		X			X
	ST				X	X	X	X

*CO - Combat

SC - Surveillance and Communications

ST - Skilled Technical (Secondary ASVAB Test for 96H)

**AR - Arithmetic Reasoning

AS - Auto & Shop Information

CS - Coding Speed

GS - General Science

MC - Mechanical Comprehension

MK - Math Knowledge

VE - Verbal Equivalent - Consist of:

WK - Work Knowledge

PC - Paragraph Comprehension

MOS 96H has a primary ASVAB test of SC and a secondary of ST. MOS 11H ASVAB test is CO. The difference between the SC and CO ASVAB tests is that the SC test requires a component of VE while the CO requires a component of CS. The only common test component between the ST and CO ASVAB tests is the component MK. The ST ASVAB test requires that the soldier demonstrates mathematical and verbal skills. The ST test also requires the soldier to demonstrate knowledge in the general science area. There is no equivalent of the GS test for the 11H MOS. However, considering the fact that 99.4% of the 11H soldiers are high school graduates they should possess a general knowledge scientific principles.

I1-2.5.3 Education Level. As stated in paragraph I1-2.3 100% of the soldiers in MOS 96H are high school graduates while 99.4% of the 11H soldiers are high school graduates.

I1-3.0 SENSITIVITY ANALYSIS. A series of sensitivity analyses were conducted to determine the most reasonable ways to reduce the risk associated with the requiring the 11H to operate the NLOS-CA console. The following is a discussion of these analyses.

I1-3.1 Color Vision. Making normal color vision a requirement for soldiers in MOS 11H will reduce the overall difference between the 96H and 11H MOS to .08 points. The same result can be achieved by designing the displays for soldiers that do not possess normal color vision. Figure I1-3-1 is a graphical representation of the results of this analysis.

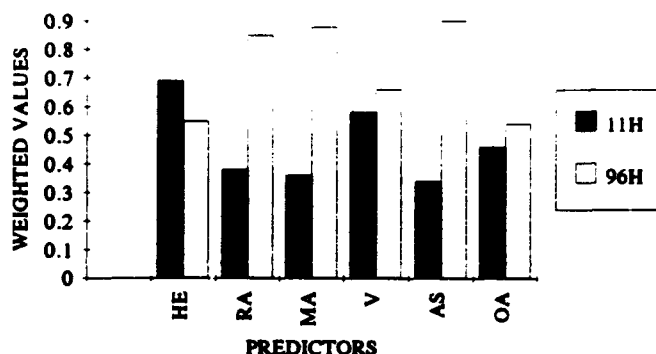


FIGURE I1-3-1 RESULTS OF REQUIRING MOS 11H TO POSSESS NORMAL COLOR VISION

HE - HAND EYE COORDINATION
RA - READING ABILITY
MA - MATH ABILITY
V - VISION
AS - ANALYTICAL SKILLS
OA - OVERALL SCORE

I1-3.2 Visual Acuity. Making the PULHES physical serial profile requirement a 1 for eyes soldiers in MOS 11H will reduce the overall difference between the 96H and 11H MOS to .17 points. Figure I1-3-2 is a graphical representation of the results of this analysis.

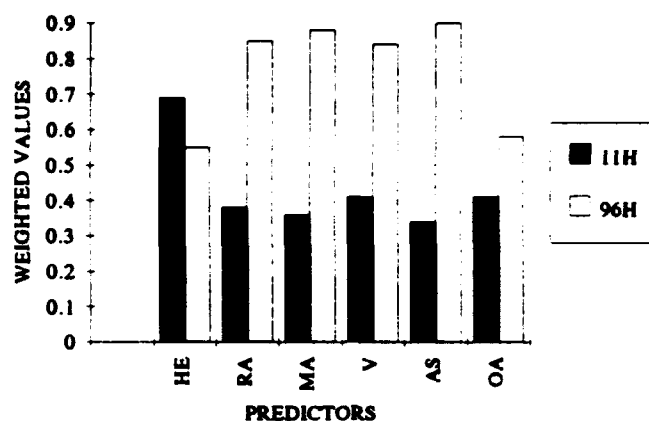


FIGURE I1-3-2 RESULTS OF REQUIRING MOS 11H TO POSSESS THE SAME VISUAL ACUITY REQUIREMENTS AS MOS 96H

I1-3.3 Color Vision and Visual Acuity. If these two attributes are combined the overall difference between the 11H and 96H MOS is reduced to .06 points. Figure I1-3-3 is a graphical representation of the results of this analysis.

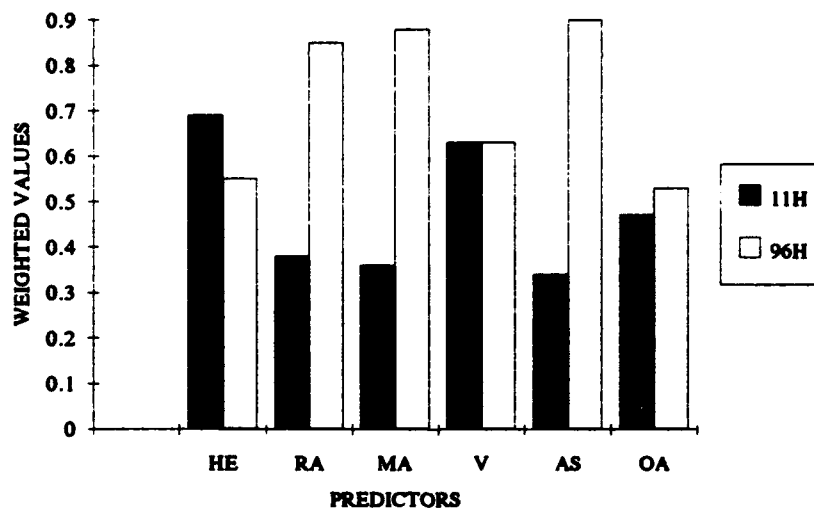


FIGURE I1-3-3 RESULTS OF REQUIRING MOS 11H TO POSSESS NORMAL COLOR VISION AND THE SAME VISUAL ACUITY REQUIREMENTS AS MOS 96H

I1-3.4 ASVAB Test. If the soldiers in the 11H MOS were required to have a secondary ASVAB test of ST this would reduce the overall difference between the 96H and 11H MOS to .17 points. Figure I1-3-4 is a graphical representation of the results of this analysis.

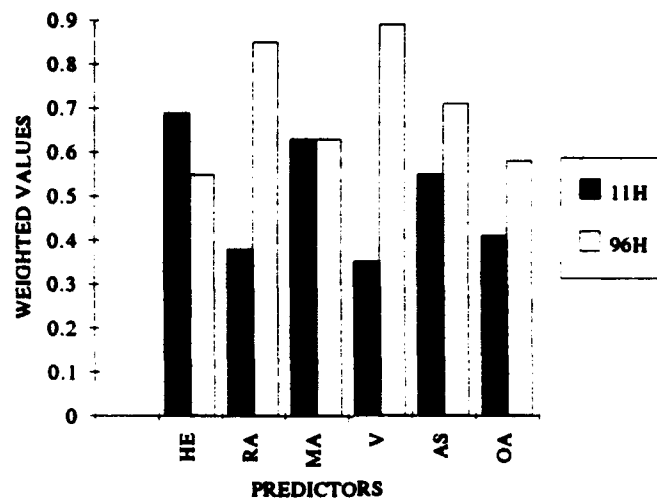


FIGURE I1-3-4 RESULTS OF REQUIRING MOS 11H TO POSSESS A SECONDARY ASVAB TEST OF ST

I1-3.5 ASVAB Test and Color Vision. If the soldiers in MOS 11H were required to have a secondary ASVAB of ST and normal color vision the difference between the 96H and 11H MOS is reduced to .05 points. Figure I1-3-5 is a graphical representation of the results of this analysis.

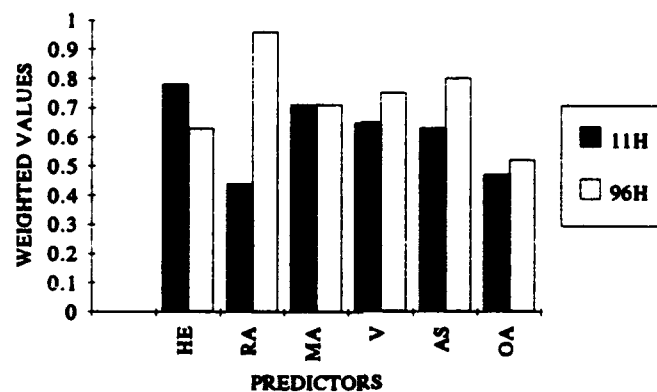


FIGURE I1-3-5 RESULTS OF REQUIRING MOS 11H TO POSSESS A SECONDARY ASVAB TEST OF ST AND NORMAL COLOR VISION

I1-3.6 ASVAB Test and Visual Acuity. If the soldiers in MOS 11H were required to have a secondary ASVAB of ST and a PULHES physical serial profile requirement of 1 for eyes the difference between the 96H and 11H MOS is reduced to .23 points. Figure I1-3-6 is a graphical representation of the results of this analysis.

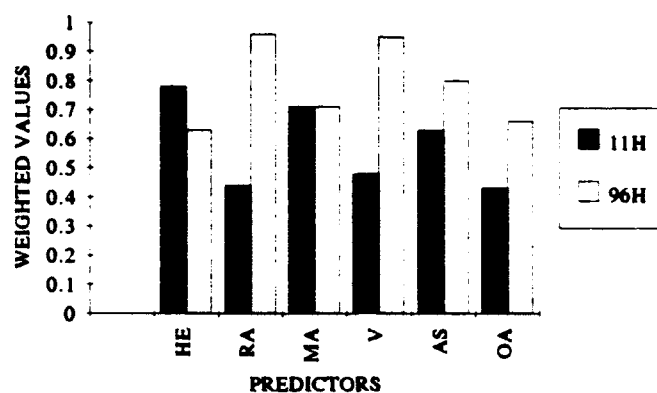


FIGURE I1-3-6 RESULTS OF REQUIRING MOS 11H TO POSSESS A SECONDARY ASVAB TEST OF ST AND THE SAME VISUAL ACUITY REQUIREMENTS AS MOS 96H

I1-3.7 ASVAB Test, Normal Color, and Visual Acuity. If the three evaluation criteria were combined the overall difference between the 96H and 11H MOS is to .02 points. Figure I1-3-7 is a graphical representation of the results of this analysis.

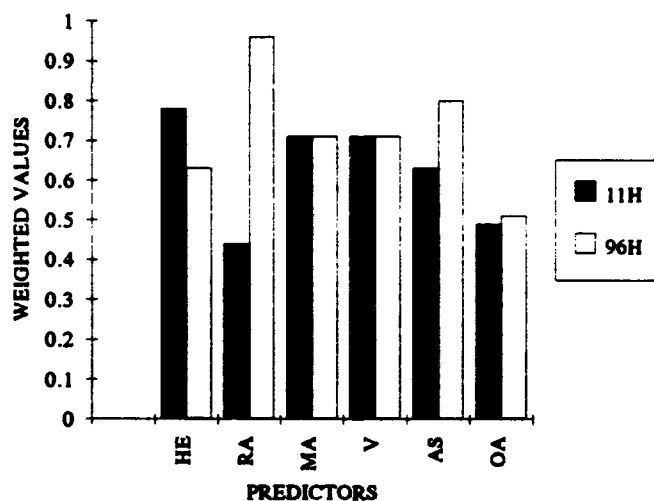


FIGURE I1-3-7 RESULTS OF REQUIRING MOS 11H TO POSSESS A SECONDARY ASVAB TEST OF ST, NORMAL COLOR VISION, AND THE SAME VISUAL ACUITY REQUIREMENTS AS MOS 96H

SECTION II
TARGET AUDIENCE DESCRIPTION

Target Audience Description (TAD)

MOS 11H : Heavy Antiarmor Weapons Infantryman
 CMP 11 : Infantry
 Branch 1 : Infantry

Primary ASVAB : CO Actual Cutoff : 90
 (1) Test: Combat (CO)

(2) Components of the CO Test Include

Arithmetic Reasoning (AR)
 Auto & Shop Information (AS)
 Mechanical Comprehension (MC)
 Coding Speed (CS)

Section A: STATISTICS

1. Manpower Status (FY 1993)

Skill Level	1	2	3	4	5	
Grade(s)	E1-E4	E5	E6	E7	E8-E9	Total
Authorized	2526.0	503.0	632.0	387.0	120.0	4168.0
Operating	2638.0	577.0	668.0	365.0	135.0	4383.0
Oper/Auth	1.04	1.15	1.06	0.94	1.13	1.05

2. Manpower Requirement Projections

Skill Level	1	2	3	4	5	
Grade(s)	E1-E4	E5	E6	E7	E8-E9	Total
Current 1993	2638	577	668	365	135	4383

3. Aptitude (in percentages)

a. AFQT - Test Score Category Distribution

	Categories				
	I	II	IIIA	IIIB	IV
Current 1993	4.3	34.2	24.4	27.1	10.0

b. ASVAB Aptitude Area Score Distribution

	<75	75-84	85-94	95-104	105-114	115-124	125-134
Current 1993	0.5	5.5	15.0	23.6	31.5	19.0	4.8

c. Reading Grade Level Distribution

	<7	7-9	9-11	11-12	>12
Current 1993	1.6	27.6	19.6	46.2	5.0

d. Civilian Education

	HSG	Non-HSG
Current 1993	99.4	0.6

4. Biographical Information (in percentages)

a. Gender Mix

	Male	Female
Current 1993	100.0	0.0

SECTION B: DESCRIPTIVE INFORMATION (SOURCE AR 611-201, Jun 91)

1. Rescind date: -0-

2. Education: NA

3. Security Clearance: U

4. Physical Qualifications:

a. PULHES Profile: 111221

b. MEPSCAT Rating: VH

c. Vision Requirements: RG

5. Skills and Knowledge Trained:

Skill Level	Tasks
10	Defends position and self against enemy attack.
10	Employs individual weapons.
10	Employs cover, concealment, and camouflage.
10	Prepares, loads and fires the TOW weapons system.
10	Drives the TOW carrier.
10	Protects self, weapons, and equipment from chemical and other contamination.
10	Assists in construction of fortifications and barriers including minefields and obstacles.
10	Assists in breaching and clearing minefields and obstacles.
10	Identifies enemy armor and other targets.
10	Performs preventive maintenance and assists in organizational maintenance on weapons and equipment.
10	Performs land navigation functions.
10	Carries, prepares, and stores ammunition.
10	Administers first aid.
10	Applies field sanitation methods.
10	Reacts to oral commands and visual signals.
10	Applies principles of escape and evasion.
10	Renders oral reports on enemy activities.
10	Lays field wire.
10	Performs basic communications functions, and operates communications equipment.
10	Applies security and safety measures.
10	Collects and reports tactical information as member of combat or reconnaissance patrol.
10	Prepares simple demolitions.
10	Operates wheeled and tracked vehicles to transport personnel,

supplies, and equipment.

- 10 Performs drill and ceremonies and other post, camp, and station duties.
- 10 Carries and prepares ammunition for use and loads weapons.
- 10 Administers first aid.
- 10 Conducts preventive maintenance checks and services (PMCS) on organizational equipment.
- 20 Receives and implements combat orders.
- 20 Directs employment of personnel in offensive, defensive, and retrograde combat operations.
- 20 Evaluates terrain.
- 20 Selects weapons emplacement sites, and assigns target areas and fields of fire.
- 20 Directs and adjusts fires to destroy enemy targets.
- 20 Supervises construction of fortifications, camouflage, and security.
- 20 Reads and interprets maps and aerial photos.
- 20 Prepares range cards and field sketches.
- 20 Supervises crew training, drill, march order, and firing.
- 20 Trains crew in day and night firing techniques.
- 20 Supervises various work details.
- 30 Receives and issues orders.
- 30 Supervises tactical deployment of section.
- 30 Supervises receipt, storage, and distribution of ammunition, supplies, and food.
- 30 Establishes observation post.
- 30 Orders fire to destroy enemy equipment, positions, and personnel.
- 30 Coordinates fire power.
- 30 Observes and shifts section fires.
- 30 Advises on tactical situation.

- 30 Requests and adjusts supporting fires.
- 30 Coordinates weapons and vehicle employment.
- 30 Supervises maintenance of section weapons and equipment.
- 30 Instructs replacement personnel.
- 30 Enforces communications procedures.
- 30 Employs weapons to maximize the capabilities of weapons.
- 30 Employs weapons to take advantage of the terrain.
- 40 Assists in planning, organizing, directing, supervising, training, coordinating, and reporting activities of subordinate sections and squads.
- 40 Advises commander on tactical employment of weapons system.
- 40 Assists in coordination and administration matters, and communications activities.
- 40 Performs duties as vehicle element or dismount element leader.
- 40 Assists platoon leader in controlling infantry fighting platoon in mounted or dismounted operations.
- 40 Acts as platoon leader in superior's absence.
- 40 Processes operations and intelligence information.
- 40 Assists in planning, organizing, directing, supervising, training, coordinating, and reporting activities of subordinate squads.
- 40 Supervises receipt, storage, and distribution of ammunition, supplies, equipment, and food to subordinate elements.
- 40 Supervises platoon preventive and operator maintenance activities of IFV.
- 40 Collects intelligence information to support combat operations.
- 40 Supervises and trains personnel in fighting vehicle operations, maintenance, and intelligence activities.
- 40 Assists in dissemination of intelligence information to unit and staff sections.
- 40 Assists in coordination and implementation of combat

operations, training programs, and administrative and communications procedures.

- 40 Assists in production and administration of staff journals, files, records, and reports.
- 40 Assists in organization and operation of the tactical operations center.
- 50 Provides tactical and technical guidance to subordinates, and professional support to lower and higher grade personnel in the accomplishment of their duties.
- 50 Serves as principal noncommissioned officer in a heavy antiarmor weapons company and supervises the processing of operations and intelligence information in an infantry battalion or higher level unit.
- 50 Performs principal noncommissioned officer duties associated with first sergeant SQI "M".
- 50 Plans, coordinates, supervises, and participates in activities pertaining to organization, training, and combat operations and intelligence of units at battalion or higher level.

Note : All values reflect use of the primary ASVAB and Cutoff where relevant.

Target Audience Description (TAD)

MOS 96H : Aerial Intelligence Specialist
 CMP 96 : Military Intelligence
 Branch 35 :

Primary ASVAB : SC Actual Cutoff : 95
 (1) Test: Surveillance & Communication (SC)

(2) Components of the SC Test Include

Arithmetic Reasoning (AR)
 Auto & Shop Information (AS)
 Mechanical Comprehension (MC)
 Verbal Equivalent (VE) = WK + PC)
 Work Knowledge (WK)
 Paragraph Comprehension (PC)

Secondary ASVAB : ST Actual Cutoff : 95
 (1) Test: Skilled Technical (ST)

(2) Components of the ST Test Include

Verbal Equivalent (VE) = WK + PC)
 Work Knowledge (WK)
 Paragraph Comprehension (PC)
 Math Knowledge (MK)
 Mechanical Comprehension (MC)
 General Science (GS)

Section A: STATISTICS

1. Manpower Status (FY 1993)

Skill Level	1	2	3	4	5	
Grade(s)	E1-E4	E5	E6	E7	E8-E9	Total
Authorized	82.0	37.0	29.0	19.0	0.0	167.0
Operating	87.0	31.0	30.0	28.0	0.0	176.0
Oper/Auth	1.06	0.84	1.03	1.47	0.00	1.05

2. Manpower Requirement Projections

Skill Level	1	2	3	4	5	
Grade(s)	E1-E4	E5	E6	E7	E8-E9	Total
Current 1993	87	31	30	28	0	176

3. Aptitude (in percentages)

a. AFQT - Test Score Category Distribution

		Categories				
		I	II	IIIA	IIIB	IV
Current 1993		10.2	54.5	24.4	8.5	2.3

b. ASVAB Aptitude Area Score Distribution

		<75	75-84	85-94	95-104	105-114	115-124	125-134
Current	1993	0.6	3.3	10.1	24.8	31.3	23.6	6.4

c. Reading Grade Level Distribution

		<7	7-9	9-11	11-12	>12
Current	1993	0.3	12.2	16.2	59.4	11.9

d. Civilian Education

		HSG	Non-HSG
Current	1993	100.0	0.0

4. Biographical Information (in percentages)

a. Gender Mix

		Male	Female
Current	1993	84.1	15.9

SECTION B: DESCRIPTIVE INFORMATION (SOURCE AR 611-201, Jun 91)

1. Rescind date: -0-

2. Education: NA

3. Security Clearance: S

4. Physical Qualifications:

a. PULHES Profile: 222111

b. MEPSCAT Rating: MH

c. Vision Requirements: NC

5. Skills and Knowledge Trained:

Skill Level

Tasks

- 1F Performs preflight, preoperation, operator, and unit maintenance on assigned sensor SERE and associated equipment.**
- 1F Troubleshoots sensor and associated systems to determine nature and location of fault occurrence.**
- 1F Records operation and maintenance data in equipment log for support maintenance services.**
- 1F Participates in mission planning for aerial surveillance, aerial visual reconnaissance, aerial search and rescue, aerial radiological survey, and similar intelligence and information gathering missions.**
- 1F Operates data link terminal station and performs SLAR imagery analysis.**
- 1F Prepares and operates aerial surveillance/electronic intercept systems and associated equipment.**
- 1F Performs aerial missions using visual acquisition skills and the operation of manned aerial infrared, radar, photographic, or similar sensor systems, including associated data transmission links and ground data terminal stations.**
- 1F Performs radio communications and aids aviator in aerial navigation.**
- 1F Recognizes enemy electronic countermeasures directed against aircraft or ground component communications or sensor system equipment and performs applicable ECCM.**
- 1F Visually acquires targets, or interprets target signatures appearing on near real time sensor system displays and renders inflight spot reports on targets of opportunity.**
- 1F Participates in mission debriefing and assists imagery analyst in analysis of imagery recordings.**
- 2F Assists imagery analyst to interpret imagery recording using imagery analysis keys and reference material to obtain essential information.**
- 2F Operates and supervises the operation of aerial surveillance and associated equipment.**
- 2F Operates and supervises operation of aerial surveillance/electronic intercept systems and associated equipment.**

- 2F Assists aviator in flight planning, weather analysis, navigational computations, and aircraft preflight inspection procedures.
- 2F Prepares aerial surveillance and associated equipment for operation.
- 2F Performs duties shown in preceding level of skill and provides technical guidance to lower grade personnel in accomplishment of their duties.
- 2F Serves as assistant instructor at service school.
- 3F Performs duties shown in preceding level of skill and provides technical guidance to lower grades in performance of their duties.
- 3F Supervises operations and activities of aerial surveillance, electronic intercept, and data terminal section.
- 3F Supervises inspection and operator maintenance of section-assigned SERE equipment and operator and organizational maintenance of assigned sensor and associated equipment.
- 3F Directs and conducts job proficiency and SERE training of subordinates in section to which assigned.
- 3F Assists in planning, employment, and management of aerial surveillance, electronic intercept, and data terminal systems.
- 3F Serves as instructor at service school.
- 3F Assists imagery analyst in analysis and interpretation of aerial sensor imagery to determine geographical features of terrain and physical features of enemy installations, deployment, weapons, equipment, and defenses.
- 3F Conducts or participates in briefing of commander and staff of supported headquarters on capabilities and limitations of aerial surveillance and similar missions, and on results obtained from their employment.
- 4F Performs duties shown in preceding level of skill and provides technical guidance to lower grade personnel in accomplishment of their duties.
- 4F Supervises operations and activities of platoon or detachment to which assigned.
- 4F Plans and organizes work schedules.
- 4F Assigns duties and instructs section sergeant in proper work

techniques and procedures.

- 4F Reviews and critiques mission results obtained by unit subordinates.
- 4F Directs and conducts aviation-peculiar standardization training for subordinate personnel.
- 4F Advises commander on interface of aerial surveillance, electronic intercept, and data terminal systems and associated equipment.
- 4F Advises commander on interface of aerial surveillance with ground surveillance.
- 4F Coordinates personnel and aerial sensor section on data terminal section or team employment, deployment, and operational supply and maintenance support requirements.
- 4F Serves as instructor at service school.

Note : All values reflect use of the primary ASVAB and Cutoff where relevant.

**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)
MANPOWER, PERSONNEL AND LOGISTICS IMPACT ANALYSES (LIA)**

**APPENDIX J
MTMC/TEA TRANSPORTATION SUB-ANALYSIS**



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY
720 THIMBLE SHOALS BOULEVARD, SUITE 130
NEWPORT NEWS, VIRGINIA 23606-2574

MTTE-COEA (70-47a)

21 OCT 1993

MEMORANDUM FOR Director, U.S. Army TRAC-LEE, ATTN: ATRC-LS (Mr.
F. Vanover), Fort Lee, VA 23801-6140

SUBJECT: Transportability and Deployability Analysis for the
Non-Line of Sight-Combined Arms Logistics Impact Analysis
(NLOS-CA LIA)

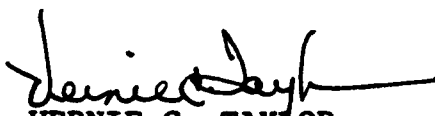
1. Reference memorandum, TRAC-LEE, ATRC-LS, 6 July 93, Subject:
Logistics Data Support for the NLOS-CA LIA.

2. In the referenced memorandum, you requested that we complete
our section of the NLOS-CA LIA. We are enclosing the NLOS-CA
Transportability and Deployability Analysis.

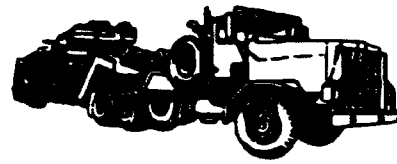
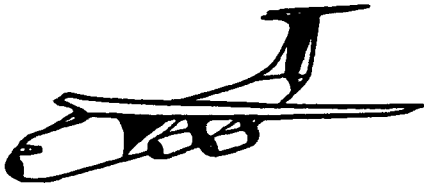
2. If you have any questions or need further assistance, please
contact Mr. R. Bryan Reyns, DSN 927-4646 or (804) 599-1107, or
LCDR C. Ben Lawrimore, DSN 927-5266 or (804) 599-1667.

FOR THE DIRECTOR:

Encl


VERNIE C. TAYLOR
Project Advisory Board
NLOS-CA LIA Team

R-22 OCT 93
m.h.



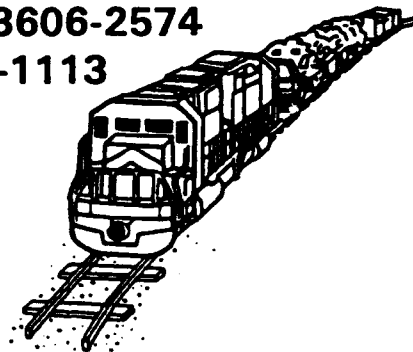
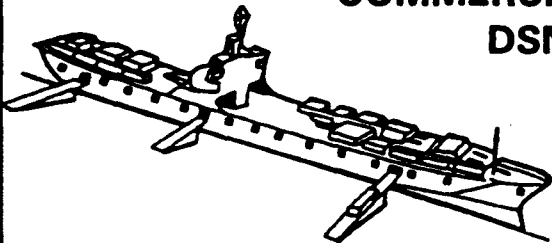
OCTOBER 1993

**TRANSPORTABILITY & DEPLOYABILITY
ANALYSIS
for the
NON-LINE OF SIGHT-COMBINED ARMS
(NLOS-CA)**

Prepared by:
R. BRYAN REYNS
LCDR C. BEN LAWRIKMORE



**MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY
720 THIMBLE SHOALS BLVD., SUITE 130
NEWPORT NEWS, VIRGINIA 23606-2574
COMMERCIAL (804) 599-1113
DSN 927-4646**



**NON-LINE OF SIGHT-COMBINED ARMS (NLOS-CA)
Transportability and Deployability Analysis**

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NON-LINE OF SIGHT-COMBINED ARMS (NLOS-CA)
Transportability and Deployability Analysis

1. (U) General.

a. (U) Transportability and Deployability. This analysis addresses the transportability and deployability impact of adding a NLOS-CA capability to both a heavy and light brigade.

(1) (U) Transportability is defined as the inherent capability of an item of equipment or a system to be efficiently moved by required transportation assets and modes of transport.

(2) (U) Deployability is the capability of a force to be moved intraCONUS, intertheater (strategic), and intratheater (tactical) to support a military operation.

b. (U) Purpose and Objectives. This analysis evaluates the impact of fielding each alternative system on item transportability and force deployability by the highway, air, rail, and marine modes.

c. (U) Scope. We completed transportability and deployability analyses for each alternative. The analyses discuss transportability and deployability requirements and restrictions imposed on system and unit equipment. The transportability analyses address system-peculiar items only, while the deployability analyses consider all unit equipment at the battalion level as given in the tables of organization and equipment (TOE) in appendix A. Some movement restrictions may be eased during emergency deployments. This, however, cannot be guaranteed. Therefore, all transportability and deployability restrictions imposed during peacetime must be met.

d. (U) System Characteristics. The dimensions and weights for each alternative system are shown in Table 1.1. The base case and each alternative force consists of a heavy and light brigade.

(1) (U) Base Case. The base case has no NLOS capability.

(2) (U) Alternative 1. Alternative 1 includes the addition of an NLOS-CA company, to both the heavy and light brigades, equipped with Fiber Optic Guided Missile (FOG-M) systems carried on Heavy High Mobility Multipurpose Wheeled Vehicles (HHVs).

(3) (U) Alternative 2. Alternative 2 includes the addition of a Long Range Smart Mortar (LRSM) company, to both the heavy and light brigades. The heavy variant (LRSM HVY) is mounted on the M1064 mortar carrier, and the light variant (LRSM LT) is mounted on the HHV.

e. (U) Force Structure. The force structures for the base case and the alternatives were taken from the April 1993 Objective TOE. The Objective TOE has all Basis of Issue Plans applied. These force structures have been approved for use in this study by the Training and Doctrine Command (TRADOC) Analysis Command (TRAC) Study Director.

TABLE 1.1
SYSTEM-PECULIAR EQUIPMENT DIMENSIONAL AND WEIGHT DATA

Item	Length (Inches)	Width (Inches)	Height (Inches)	Weight (Pounds)
FOG-M	187.5	85.0	72.1	8,945
LRSM LT	335.4	85.0	83.0	11,985
LRSM HVY	209.4	119.0	104.8	27,635
Legend: FOG-M: Fiber Optic Guided Missile LRSM LT: Long Range Smart Mortar, Light Version LRSM HVY: Long Range Smart Mortar, Heavy Version				

(1) (U) Base Case Force Structure. The base case heavy brigade consists of one headquarters, headquarters company (HHC), two mechanized infantry battalions, and two heavy tank battalions, as shown in Table 1.2. The base case light brigade consists of one HHC and three light infantry battalions as shown in Table 1.3.

(2) (U) FOG-M Force Structure. The alternative one heavy brigade consists of one HHC, two mechanized infantry battalions, two heavy tank battalions, and one light NLOS company, as shown in Table 1.4. The alternative one light brigade consists of one HHC, three light infantry battalions and one light NLOS company, as shown in Table 1.5.

(3) (U) LRSM Force Structure. The alternative two heavy brigade consists of one HHC, two mechanized infantry battalions, two heavy tank battalions, and one heavy NLOS company, as shown in Table 1.6. The alternative two light brigade consists of one HHC and three light infantry battalions, and one light NLOS company, as shown in Table 1.7.

2. (U) Summary of Findings. These results are based on the requirement for maximum transportability with minimum deployment assets during intraCONUS, intertheater, and intratheater transport. The following summarizes the major advantages and disadvantages of the systems.

a. (U) IntraCONUS.

(1) (U) Highway. The FOG-M and the LRSM LT will move over CONUS highways without restriction. The LRSM HVY is transportable on the M916/M172A1 truck tractor/semitrailer and similar combinations. However, this combination may require special routing in the U.S. because of width restrictions.

(2) (U) Rail. The FOG-M, LRSM LT, and LRSM HVY are capable of unrestricted rail transport within CONUS.

(3) (U) Deployment.

(a) Heavy Brigade. The base case requires fewer railcars than the FOG-M or LRSM equipped forces. However, the FOG-M force, which requires only ten more railcars than the base case, does not require any additional deployment time. Table 2.1 summarizes the requirements for deployment by rail.

(b) Light Brigade. The base case requires ten fewer railcars than the FOG-M and eleven fewer than the LRSM equipped forces. However, deployment time does not differ significantly due to the small size of the force. Table 2.2 summarizes the requirements for deployment by rail.

b. (U) Intertheater.

(1) (U) Strategic Air. The FOG-M, LRSM LT, and LRSM HVY (reduced) are transportable by C-141 and C-5 aircraft.

(2) (U) Marine. All systems are readily transportable by strategic materiel transport vessels.

(3) (U) Deployment.

TABLE 1.2
CURRENT FORCE (BASE CASE-HEAVY) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
87042L200	HHC	1	32	4,117	186	644
07245L000	INF BN	2	321	58,178	4,873	11,704
17375L000	TANK BN	2	250	54,463	5,944	11,281
Brigade Total			1,174	229,400	21,819	46,614
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion TANK BN: Tank Battalion TOE: Table of Organization and Equipment						

TABLE 1.3
CURRENT FORCE (BASE CASE-LIGHT) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
77042L000	HHC	1	74	9,753	359	1,626
07015L000	INF BN	3	40	5,541	203	793
Brigade Total			194	26,375	968	4,005
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion TOE: Table of Organization and Equipment						

TABLE 1.4
FOG-M (ALTERNATIVE 1-HEAVY) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
87042L200	HHC	1	32	4,117	186	644
07245L000	INF BN	2	321	58,178	4,873	11,704
17375L000	TANK BN	2	250	54,463	5,944	11,281
07348T200	NLOS CO	1	36	4,821	203	803
Brigade Total			1,210	234,221	22,022	47,416
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion NLOS CO: Non-Line of Sight Company TOE: Table of Organization and Equipment TANK BN: Tank Battalion FOG-M: Fiber Optic Guided Missile						

TABLE 1.5
FOG-M (ALTERNATIVE 1-LIGHT) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
77042L000	HHC	1	74	9,734	344	1,626
07015L000	INF BN	3	40	5,541	203	793
07348L200	NLOS CO	1	36	4,821	203	803
Brigade Total			230	31,196	1,171	4,808
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion NLOS CO: Non-Line of Sight Company TOE: Table of Organization and Equipment FOG-M: Fiber Optic Guided Missile						

TABLE 1.6
LRSM (ALTERNATIVE 2-HEAVY) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
87042L200	HHC	1	32	4,117	186	644
07245L000	INF BN	2	321	58,178	4,873	11,704
17375L000	TANK BN	2	250	54,463	5,944	11,281
07348T100	NLOS CO	1	35	5,744	460	1,032
Brigade Total			1,209	235,144	22,279	47,646
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion TANK BN: Tank Battalion TOE: Table of Organization and Equipment NLOS CO: Non-Line of Sight Company LRSM: Long Range Smart Mortar						

TABLE 1.7
LRSB (ALTERNATIVE 2-LIGHT) TOE SUMMARY

TOE	Unit	Multiple	Number of Vehicles	Square Feet	Short Tons	Measurement Tons
77042L000	HHC	1	74	9,753	359	1,626
07015L000	INF BN	3	40	5,541	203	793
07348T200	NLOS CO	1	48	5,727	211	398
Brigade Total			242	32,103	1,179	4,903
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion TOE: Table of Organization and Equipment NLOS CO: Non-Line of Sight Company LRSB: Long Range Smart Mortar						

TABLE 2.1
SUMMARY OF RAILCAR REQUIREMENTS (HEAVY BDE)

System	Unit	Multiple	Railcar Type	Quantity
Base Case	HHC	1	89-foot Flatcar	8
			60-foot Flatcar	1
	INF BN	2	89-foot Flatcar	64
			60-foot Flatcar	38
			68-foot DODX	4
TANK BN	2	89-foot Flatcar	51	
		60-foot Flatcar	8	
		68-foot DODX	33	
Brigade Totals			89-foot Flatcar	238
			60-foot Flatcar	93
			68-foot DODX	74
Alternative 1	HHC	1	89-foot Flatcar	8
			60-foot Flatcar	1
	INF BN	2	89-foot Flatcar	64
			60-foot Flatcar	38
			68-foot DODX	4
	TANK BN	3	89-foot Flatcar	51
60-foot Flatcar			8	
68-foot DODX			33	
NLOS CO	1	89-foot Flatcar	10	
		60-foot Flatcar	-	
		68-foot DODX	-	
Brigade Totals			89-foot Flatcar	248
			60-foot Flatcar	93
			68-foot DODX	74
Alternative 2	HHC	1	89-foot Flatcar	8
			60-foot Flatcar	1 —
	INF BN	2	89-foot Flatcar	64
			60-foot Flatcar	38
			68-foot DODX	4
	TANK BN	2	89-foot Flatcar	51
60-foot Flatcar			8	
68-foot DODX			33	
NLOS CO	1	89-foot Flatcar	6	
		60-foot Flatcar	7	
		68-foot DODX	-	
Brigade Totals			89-foot Flatcar	244
			60-foot Flatcar	100
			68-foot DODX	74
Legend: HHC: Headquarters, Headquarters Company INF BN: Infantry Battalion TANK BN: Tank Battalion NLOS CO: Non-Line of Sight Company				

TABLE 2.2
SUMMARY OF RAILCAR REQUIREMENTS (LIGHT BDE)

System	Unit	Multiple	Railcar Type	Quantity
Base Case	HHC	1	89-foot Flatcar	19
	INF BN	3	89-foot Flatcar	12
	Brigade Totals		89-foot Flatcar	55
Alternative 1	HHC	1	89-foot Flatcar	19
	INF BN	3	89-foot Flatcar	12
	NLOS CO	1	89-foot Flatcar	10
	Brigade Totals		89-foot Flatcar	65
Alternative 2	HHC	1	89-foot Flatcar	19
	INF BN	3	89-foot Flatcar	12
	NLOS CO	1	89-foot Flatcar	11
	Brigade Totals		89-foot Flatcar	66

Legend:
HHC: Headquarters, Headquarters Company
INF BN: Infantry Battalion
NLOS CO: Non-Line of Sight Company

(a) Heavy Brigade. The base case and the FOG-M force require one less C-5 aircraft sortie than the LRSM force. The base case requires ten fewer C-141 aircraft sorties than the FOG-M and twenty-two fewer than the LRSM. Table 2.3 summarizes the number of aircraft sorties required for strategic deployment. Air deployment times are difficult to estimate given the many variables; however, the base case will clearly be the quickest to deploy. Each system requires two Fast Sealift Ships (FSS) or one Large Medium-Speed Roll-On/Roll-Off (RORO) ship to deploy by sea. Sea deployment times do not differ between forces.

(b) Light Brigade. None of the three forces requires C-5 air transport. The base case requires ten fewer C-141 aircraft sorties than the FOG-M and eleven fewer than the LRSM. Table 2.4 summarizes the number of aircraft sorties for tactical air deployment. The base case will require less time to deploy than the two alternatives. Each force requires only one small RORO ship to deploy by sea. Sea deployment times do not differ between systems.

c. (U) Intratheater.

(1) (U) Highway. The FOG-M and LRSM LT are capable of unrestricted highway transport worldwide. The M-16/M172A1/LRSM HVY combination has transport restrictions in most foreign countries due to height, width, and weight. Foreign highway officials will require permits in locations where the system exceeds the highway legal limits.

(2) (U) Tactical Air. The FOG-M, LRSM LT, and LRSM HVY (reduced) are transportable by C-130 aircraft.

(3) (U) Helicopter Transport. The FOG-M and LRSM LT are within the design limitations for external air transport (EAT) by CH-47 helicopters. The LRSM HVY, due to its weight, is not suitable for helicopter transport.

(4) (U) Rail. The FOG-M, LRSM LT, and LRSM HVY are capable of unrestricted rail transport worldwide.

(5) (U) Logistics-Over-the-Shore (LOTS). All systems are transportable on the LARC-LX and larger lighterage vessels of the Army tactical watercraft fleet.

(4) (U) Deployment.

(a) Heavy Brigade. Since none of the three force alternatives is C-130 air transportable and must rely in large part on roadmarch and rail transport to fully accomplish required tactical movements, a Transportability Analysis Reports Generator (TARGET) model analysis was not conducted to determine tactical air requirements.

(b) Light Brigade. The NLOS company has one truck that is not C-130 air transportable and must be transported via roadmarch or rail. The base case requires twenty-one fewer C-130 aircraft sorties than the FOG-M equipped force and twenty-five fewer C-130 aircraft sorties than the LRSM equipped force. Table 2.4 summarizes the number of aircraft sorties required for tactical air deployment.

d. (U) Conclusions. The base case is preferred over the alternatives

TABLE 2.3
SUMMARY OF AIR SORTIE REQUIREMENTS (HEAVY BRIGADE)

System	Movement Mode	Aircraft Type	Number of Sorties				
			HHC	INF BN	TANK BN	NLOS CO	BDE
Base Case	Intertheater (Strategic)	C-141	5	90	38	-	261
		C-5	1	43	70	-	227
Alternative 1	Intertheater (Strategic)	C-141	5	90	38	8	271
		C-5	1	43	70	4	227
Alternative 2	Intertheater (Strategic)	C-141	5	93	38	-	283
		C-5	1	43	70	-	228

Note: Allowable Cabin Loads (ACLs) were based on a standard critical leg of 3,000 nautical miles without air refueling.
ACLs are: C-141 - 50,000 lbs; C-5 - 150,000 lbs. (Reference: Letter, Air Mobility Command, dated 26 Aug 93)

Legend:
HHC: Headquarters, Headquarters Company
INF BN: Infantry Battalion
TANK BN: Tank Battalion
NLOS CO: Non-Line of Sight Company
BDE: Brigade

TABLE 2.4
SUMMARY OF AIR SORTIE REQUIREMENTS (LIGHT BRIGADE)

System	Movement Mode	Aircraft Type	Number of Sorties			
			HHC	INF BN	NLOS CO	BDE
Base Case	Intertheater (Strategic)	C-141	17	10	-	47
	Intratheater (Tactical)	C-5	-	-	-	-
Alternative 1	Intertheater (Strategic)	C-130	35	20	-	95
	Intratheater (Tactical)	C-141	17	10	10	57
Alternative 2	Intertheater (Strategic)	C-5	-	-	-	-
	Intratheater (Tactical)	C-130	35	20	21	116
	Intertheater (Strategic)	C-141	17	10	-	58
	Intratheater (Tactical)	C-5	-	-	-	-
		C-130	35	21	-	120

Note: Allowable Cabin Loads (ACLs) were based on a standard critical legs of 3,000 nautical miles for the C-141/C-5 and 500 nautical miles for the C-130 without air refueling. ACLs are: C-141 -50,000 lbs; C-5 150,000 lbs; C-130 - 44,000 lbs. (Reference: Letter, Air Mobility Command, dated 26 Aug 93)

Legend:
HHC: Headquarters, Headquarters Company
INF BN: Infantry Battalion
NLOS CO: Non-Line of Sight Company
BDE: Brigade

since it requires the fewest transport assets to deploy. Of the alternatives, the FOG-M equipped force is preferred because it requires fewer transport assets than the LRSM equipped force, and because the FOG-M has fewer restrictions for transport by highway and air modes.

(1) (U) The FOG-M and LRSM LT are both HHV based systems and are readily transportable by all modes. The larger and heavier LRSM HVY is far less transportable. It will require permits for highway transport and reduction for tactical and strategic air transport. Unlike the other two systems, the LRSM HVY is not transportable by C-130 aircraft or CH-47 helicopters.

(2) (U) The base case is the most effective force for intraCONUS, intertheater and intratheater deployment since it requires the fewest transport assets. Of the two alternatives, the FOG-M equipped force is the more effective system for all deployment legs since it requires fewer transport assets than the LRSM equipped force.

3. (U) Methodology.

a. (U) General. The analyses addressed highway, rail, marine, and air transportability for each alternative. The transportability analyses consisted of reviewing each system's weight and dimensional characteristics and comparing them to the capabilities of various transportation assets. Further, the deployability analyses determined how well the base case and each of the alternatives deploy from Fort Benning, Georgia (home base), to the theater of operations, Europe and Southwest Asia (SWA).

b. (U) Models/Simulations.

(1) (U) The model used to determine the transportability restrictions for the systems was the Automated Transportability Analysis (AUTOTRAN) model. AUTOTRAN analyzes a materiel system's transport configurations and determines the physical restrictions inherent to moving that system by the highway, rail, marine, and air modes of transport.

(2) (U) The model used to determine the deployability of the systems was the Transportability Analysis Reports Generator (TARGET). TARGET is a Department of the Army approved system of programs and models originally developed in 1978. It provides an automated capability for the retrieval and analysis of data for equipment authorized in organizational elements of the United States Army. TARGET merges unit equipment authorizations with equipment characteristics data to profile units. This allows data manipulations for detailed strategic mobility planning. A sample of data obtained from the system includes unit and force measures such as square feet, short tons, and measurement tons, along with equipment listings, air sortie requirements, and surface transportation requirements.

c. (U) Assumptions. To get a realistic comparison between the alternatives, we assumed all aircraft required to transport the base case, FOG-M, and LRSM brigades were available at the aerial port of embarkation. Although this will not occur when the systems deploy, we made this assumption to ensure the alternatives were analyzed on an equal basis. Movement requirements and deployment times were based on peacetime restrictions with no in-air refueling. We also assumed the new equipment will meet all transportability requirements for safe transport, to include lifting and tiedown requirements.

d. (U) Limitations.

(1) (U) Highway and Rail. Highway and rail networks for most foreign countries are limited. Information on conditions for which foreign countries would permit highway transport of oversized/overweight vehicles is not available. Except for the United States and Europe, data on railcar types and capacities are not available.

(2) (U) Structural Analysis. These analyses do not address the structural integrity of the system or the adequacy of slinging and tiedown provisions.

(3) (U) Defense Transportation System. These analyses do not address the viability of the Defense Transportation System to sustain unit deployment or the availability of transportation assets required for unit movement.

4. (U) Measures of Effectiveness.

The following restrictions/constraints are used to determine which system is the best/least restricted when moving through the Defense Transportation System.

a. (U) Transport Restrictions/Constraints

(1) (U) Highway Transport. The restrictions for highway transport are given below, from least to most restrictive. Meeting highway legal limits will allow the vehicles to move on highways without restriction. Exceeding legal limits, but within highway permit limits, requires the installation to obtain permits for highway movement of the vehicle. It may also require special routing to avoid roads not designed for larger/heavier vehicles. This increases the time required to move the vehicle. It also requires coordination with state/country highway officials. Exceeding the highway permit limit will require special routing and thus increase the trip length and time. It will also require special coordination with highway officials who may decide not to allow the vehicle to move by highway except to the nearest rail loading yard.

(a) (U) Meets highway legal limits in the United States and in foreign countries listed in the International Road Federation (IRF) highway chart - no highway permits required for transport.

(b) (U) Meets legal limits in the United States and in most countries listed in the IRF chart - some highway permits required.

(c) (U) Exceeds legal limits in some states and in some countries in the IRF chart.

(d) (U) Exceeds legal limits in all states (within permit limits) and in all countries in the IRF chart.

(e) (U) Exceeds highway legal and permit limits in the United States.

(2) (U) Rail Transport. Restrictions for rail transport are given below, from least to most restrictive. Meeting rail clearance standards allows the vehicle/system to move by the shortest route to its destination. Exceeding the standards will require route planning by the railroads, circuitous routing,

and delays in the movement of equipment, thereby increasing the cost and deployment time. Compliance with rail clearance diagrams is based on the system loaded on a 50-inch high flatcar.

(a) (U) Meets the rail clearance requirements of the Association of American Railroads (AAR) outline diagram for unrestricted rail transport in CONUS, the Gabarit International de Chargement (GIC) outline diagram for unrestricted rail transport in Europe, and the Saudi Arabia outline diagrams. These outline clearance diagrams apply to single loads, without end overhang, on open-top railcars.

(b) (U) Meets the clearance requirements of the AAR and NATO Envelope B and larger Saudi Arabia diagrams, but exceeds the requirements of the GIC and the smaller Saudi Arabia diagrams. Envelope B is less restrictive than the GIC outline diagram and covers about 85 percent of the rail routes in Europe.

(c) (U) Meets the clearance requirements of the AAR and the larger Saudi diagrams, but exceeds the requirements of the GIC, NATO Envelope B, and the smaller Saudi Arabia diagrams.

(d) (U) Meets the requirements of the Department of Defense (DOD) and larger Saudi Arabia rail clearance diagrams, but exceeds the requirements of the AAR, GIC, NATO Envelope B, and smaller Saudi Arabia diagrams. Meeting the DOD rail clearance diagram allows for unrestricted rail transport over lines in the Strategic Rail Corridor Network (STRACNET) and its connectors to military installations and activities needed for defense readiness. About 22 percent of the standard gauge rail lines in the United States meet the limits of this diagram. The larger Saudi Arabia diagram is for a rail network similar to the U.S. STRACNET.

(e) (U) Exceeds the DOD STRACNET, AAR, GIC, NATO Envelope B, and Saudi Arabia rail clearance diagrams.

(3) (U) Air Transport. Restrictions for air transport are given below, from least to most restrictive. Of the Air Mobility Command's (AMC's) primary cargo aircraft, the C-130 is the most dimensionally restrictive. If equipment is designed to fit in the C-130 aircraft, then it will also fit in the C-141, and C-5 aircraft. This allows the shipper the capability to use all of the primary AMC aircraft for tactical and strategic transport. Table 4.1 shows the restrictions for the C-130, C-141, and C-5.

(a) (U) Meets C-130, C-141, and C-5 aircraft limits.

(b) (U) Meets C-141 and C-5 aircraft limits, but exceeds C-130 aircraft limits.

(c) (U) Meets C-5, but exceeds C-130 and C-141 aircraft limits.

(d) (U) Exceeds C-130, C-141, and C-5 aircraft limits.

(4) (U) Marine Transport. The restrictions for tactical water transport and logistics-over-the-shore (LOTS) are given below, from least to most restrictive. If the components are designed for transport on the smallest vessel, they will be capable of transport on the larger vessels.

TABLE 4.1
AIR TRANSPORT DIMENSIONAL LIMITS

Aircraft	Height (in.)	Width (in.)	Length (in.)
C-130	102	107	480
C-141	103	111	1,090
C-5	156	216	1454

(a) (U) Meets the requirements of the LARC-LX and larger lightering vessels of the Army tactical watercraft fleet.

(b) (U) Meets the requirements of the LCU-1466 and larger lightering vessels of the Army tactical watercraft fleet.

b. (U) Transportation Assets Required for Movement.

(1) (U) Rail Transport - Least number of railcars.

(2) (U) Highway Transport - Least number of heavy/medium equipment transporters (HETs/METs).

(3) (U) Marine Transport - Least number of fast sealift size ships.

(4) (U) Strategic Air Transport - Least number of C-141/C-5 sorties.

(5) (U) Tactical Air Transport - Least number of C-130 sorties.

c. (U) Unit Deployment Time. The best system takes the least time to deploy. We did not look at the capability of the systems to perform their mission, we only looked at deployment times.

5. (U) Analysis and Results. We analyzed the ability of each alternative to be transported/deployed intraCONUS, intertheater, and intratheater.

a. (U) IntraCONUS.

(1) (U) Highway Restrictions/Constraints. The American Trucking Associations, Incorporated publishes dimensional and weight legal limits for highway transport throughout the United States. We have also developed a chart detailing conditions when states will issue movement permits without certification as essential to national defense. Each system was analyzed using this information.

(a) (U) FOG-M. The FOG-M is capable of unrestricted highway transport in CONUS.

(b) (U) LRSM. The LRSM LT is also capable of unrestricted highway transport in CONUS. The M916/M172A1/LRSM HVY combination exceeds the legal width limit for routine highway transport and will require permits for movement in CONUS. Table 5.1 shows the highway restrictions for the LRSM HVY.

(c) (U) Effectiveness. The FOG-M is the most effective system because it does not require permits for highway transport in either the heavy or light brigade scenarios.

(2) (U) Rail Restrictions/Constraints. The Association of American Railroads (AAR) publishes the outline diagram "Single Loads, Without End Overhang, on Open-Top Cars". The Military Traffic Management Command (MTMC) maintains the DOD clearance diagram for rail transport within the STRACNET, which is a network of civil rail lines serving major defense installations. These clearance diagrams are shown in appendix B. We used these diagrams to analyze each system for rail transport.

TABLE 5.1
SUMMARY OF WORLDWIDE HIGHWAY RESTRICTIONS FOR THE
M916/M172A1/LRSM HVY COMBINATION

	Number of Legal Limits Exceeded in the United States *	Number of Legal Limits Exceeded in Foreign Countries **
Overall Combination Length	0	86
Overall Combination Width	51	141
Overall Combination Height	0	12
Truck Single Axle	0	3
Truck Tandem Axle	0	11
Bridge Formula	0	0
Gross Weight on Network	0	10
Gross Weight off Network	0	N/A
* Out of 50 states and the District of Columbia ** Out of 142 countries		

(a) (U) FOG-M, LRSM LT, and LRSM HVY. All systems meet the AAR outline diagram for unrestricted rail transport in CONUS.

(b) (U) Effectiveness. There is no preferred system because all are equally transportable by rail in CONUS.

(3) (U) IntraCONUS Unit Movement (Required transportation assets by type and quantity, and the time it takes for the unit to travel from origin to the aerial port or seaport of embarkation).

(a) (U) Deployment by Highway. Units deploying from Fort Benning, Georgia will embark at Lawson Airfield. This aerial port of embarkation is adjacent to Fort Benning, so there is no requirement for movement by highway or rail.

(b) (U) Deployment by Rail. Deployment by sea will require CONUS rail transport to a suitable port on the east coast. Deployment times to the port of embarkation include alert, preparation, marshaling, rail loadout, transit, and unloading times. Table 5.2 summarizes deployment to the port of Savannah, Georgia. The limiting factors are rail loadout and transit times, which depend on the distance to the port and the number of railcars and unit trains required for deployment. Tables 2.1 and 2.2 show the number of railcars required to deploy each system.

1. (U) Base Case. The base case heavy brigade requires 405 railcars. The base case light brigade requires 55 railcars.

2. (U) FOG-M. The FOG-M heavy brigade requires 415 railcars. The FOG-M light brigade requires 65 railcars.

3. (U) LRSM. The LRSM heavy brigade requires 418 railcars. The LRSM light brigade requires 66 railcars.

4. (U) Effectiveness. The base case, followed closely by the FOG-M brigade in the heavy and light brigade scenarios, is the most effective system since it requires the fewest railcars to deploy.

b. (U) Intertheater (Strategic Transport).

(1) (U) Strategic Air Transport Restrictions/Constraints. Strategic air transport is accomplished with C-141 and C-5 aircraft. We compared equipment dimensional and weight characteristics with air transport certifications and aircraft transport criteria to determine suitability for strategic air transport. Table 5.3 shows the strategic air transport restrictions for each alternative.

(a) (U) FOG-M, LRSM LT, and LRSM HVY. Each system is within the dimensional and weight limitations of the C-141 and C-5 aircraft. However, the LRSM HVY must be reduced (see table 5.3) for C-141 transport.

(b) (U) Effectiveness. The FOG-M is preferred because it requires no reduction for C-141 transport in either the heavy or light brigade scenarios.

**TABLE 5.2
CONUS RAIL DEPLOYMENT**

System Brigade	Number of Railcars	Deployment Times (Hours)*		
		Loading **	Transit ***	Unloading **
Heavy Brigade				
Base Case	405	41	11	41
FOG-M	415	42	11	42
LRSM	418	42	11	42
Light Brigade				
Base Case	55	6	11	6
FOG-M	65	7	11	7
LRSM	66	7	11	7

Legend:
FOG-M: Fiber Optic Guided Missile
LRSM: Long Range Smart Mortar
* Based on optimum conditions not considering alert, preparation, or marshalling times.
** Based on an average of 6 hours per 10 car string (loading 6 strings concurrently using end ramps and circus loading).
*** Based on an average speed of 22 miles per hour over 750 miles distance for units trains of 50 or more cars.

TABLE 5.3
SUMMARY OF RESTRICTIONS FOR STRATEGIC AIR TRANSPORT

System	C-141	C-5 and C-17
FOG-M	No restrictions.	No restrictions.
LRSM LT	No restrictions.	No restrictions.
LRSM HVY	Reduce width to < 106 in. * and height to < 79.5 in. **	No restrictions.
Legend: FOG-M: Fiber Optic Guided Missile LRSM LT: Long Range Smart Mortar Light LRSM HVY: Long Range Smart Mortar Heavy * Remove mortar base plate. ** Remove machine gun.		

(2) (U) Strategic Marine Transport. Strategic materiel transport vessels include breakbulk, container, barge carriers, and roll-on/roll-off (RORO) ships. Marine transport is the least restricted mode of transport.

(a) (U) FOG-M, LRSM LT, and LRSM HVY. Each alternative is transportable by all strategic materiel transport vessels used by the Army.

(b) (U) Effectiveness. There is no preferred system because all are equally transportable by Army strategic materiel transport vessels.

(3) (U) Intertheater Unit Movement (Required transportation assets by type and quantity, and the time it takes for the unit to travel from port of embarkation to port of debarkation)

(a) (U) Deployment by Air. Strategic air deployment times from Lawson airfield to SWA are based on aircraft loading times, flight times, and unloading times of C-141 and C-5 aircraft taken from Air Force planning factors. Table 5.4 shows distances, allowable aircraft cabin loads, and one-way single-sortie deployment times under optimum conditions. Actual deployment times will take longer, but are impossible to predict. Provided delaying factors such as bad weather are equal for all systems, the limiting factors in deployment times are the number of aircraft required and the number of aircraft available. Tables 2.3 and 2.4 show the number of air sorties and type of aircraft required to deploy each force.

1. (U) Base Case. The base case heavy brigade requires 488 aircraft sorties to deploy to SWA, 227 of which are C-5's. The base case light brigade requires 47 aircraft sorties to deploy to SWA, none of which are C-5's.

2. (U) FOG-M. The FOG-M heavy brigade requires 498 aircraft sorties to deploy to SWA, of which 227 are C-5's. The FOG-M light brigade requires 57 aircraft sorties to deploy to SWA, none of which are C-5's.

3. (U) LRSM. The LRSM heavy brigade requires 511 aircraft sorties to deploy to SWA, of which 228 are C-5's. The LRSM light brigade requires 58 aircraft sorties to deploy to SWA, none of which are C-5's.

4. (U) Effectiveness. The base case, followed closely by the FOG-M brigade in the heavy brigade scenario, is the most effective system since it requires the fewest aircraft sorties to deploy. The base case in the light brigade scenario is the most effective systems since it requires fewer aircraft sorties than the FOG-M and LRSM brigades to deploy.

(b) (U) Deployment by Sea. Strategic sea deployment times include marshalling at the port, ship loading, transit, and discharge times. Deployment times vary depending on the type of shipping available. Each of the three alternatives require just two fast sealift ships to deploy in the heavy brigade scenario and only one small RORO to deploy in the light brigade scenario. Average deployment time for a FSS from Savannah, Georgia to SWA is 37 days, while the average deployment time for a small RORO is 17 days. This includes 2 days loading and 2 days discharge time. There are no differences in deployment times between systems in either scenario.

TABLE 5.4
STRATEGIC AIR DEPLOYMENT

Destination	Longest Flight Distance (No Aerial Refueling)	Aircraft Type	Allowable Cabin Load	Deployment Time *
Southwest Asia	3300 Nautical Miles	C-141 C-5	50,000 lbs 150,000 lbs	32 hours **
* Includes loading, unloading, and one-way flight times with intermodal stops. ** Single-sortie deployment time is the same for all 3 forces. Note: Recent data received from Air Mobility Command provided the ACLs for use with the SWA scenario.				

c. (U) Intratheater (Tactical Transport).

(1) (U) Highway Restrictions/Constraints. The International Road Federation (IRF) publishes legal limits governing highway transport throughout 142 foreign countries. Information on conditions for which foreign countries will issue permits is not available. We used the IRF publication to evaluate highway transportability. In general, restrictions to highway transport will be more numerous than those encountered in the United States. In SWA, movement must be determined on a country-by-country basis.

(a) (U) FOG-M. The FOG-M is capable of unrestricted highway transport worldwide.

(b) (U) LRSM. The LRSM LT is capable of unrestricted highway transport worldwide. The M916/M172A1/LRSM HVY combination exceeds the legal limits for routine highway transport and requires permits in most countries. Local officials must be contacted to determine exact restrictions to movement. Transport may require circuitous routing, resulting in delaying the availability of the system at its destination. Table 5.1 shows the number of foreign country highway restrictions for the LRSM HVY.

(c) (U) Effectiveness. The FOG-M is preferred over the LRSM because it does not require permits for routine highway transport in either the heavy or light brigade scenarios.

(2) (U) Tactical Airlift.

(a) (U) C-130 Restrictions/Constraints. Tactical air transport is accomplished by C-130 aircraft. We compared equipment dimensions and weight characteristics with air transport criteria to determine suitability for tactical air transport. Table 5.5 shows the tactical fixed-wing restrictions for each alternative.

(1) (U) FOG-M. The FOG-M requires no special preparation for C-130 transport.

(2) (U) LRSM. The LRSM LT requires no special preparation for C-130 transport. The LRSM HVY must be reduced in height and width for C-130 transport as indicated in Table 5.5.

(3) (U) Effectiveness. The FOG-M is preferred over the LRSM because it requires no special preparation for C-130 transport in either the heavy or light brigade scenarios.

(b) (U) UH-60/CH-47 Helicopter Restrictions/Constraints, External Lift. The UH-60 and CH-47 Helicopters provide limited tactical air movement of forces when airfields are not available. Helicopter transport certifications and equipment dimensional and weight characteristics were compared with helicopter operational lift capabilities to determine suitability for transport. We do not consider structural suitability of the equipment.

(1) (U) FOG-M. The FOG-M can be transported by the UH-60 and CH-47 helicopters. The Natick Research, Development and Engineering Center (NATICK) has concerns about the helicopter slings rubbing against the fire unit of the FOG-M during flight. NATICK may require a flight test before certifying the FOG-M for external air transport (EAT).

TABLE 5.5
SUMMARY OF RESTRICTIONS FOR FIXED WING TACTICAL AIR TRANSPORT

System	Restrictions for C-130 Transport
FOG-M	No restrictions.
LRSM LT	No restrictions.
LRSM HVY	Reduce width to < 106 in. * and height to < 79.5 in. **
Legend: FOG-M: Fiber Optic Guided Missile LRSM LT: Long Range Smart Mortar Light LRSM HVY: Long Range Smart Mortar Heavy * Remove mortar base plate. ** Remove machine gun.	

(2) (U) LRSM. The LRSM LT is within the design limitations of UH-60 and CH-47 helicopters for EAT. The LRSM HVY exceeds the maximum weight limits for EAT by UH-60 and CH-47 helicopters.

(3) (U) Effectiveness. The FOG-M is preferred over the LRSM because it is transportable by UH-60 and CH-47 helicopters in either the heavy or light brigade scenarios.

(3) (U) NATO Rail Restrictions/Constraints. NATO standardization agreement (STANAG) 2832, Restrictions for the Transport of Military equipment by Rail on European Railways, regulates rail transport of military equipment in NATO countries. The GIC clearance diagram establishes dimensional restrictions for unrestricted rail transport. The Envelope B clearance diagram establishes preplanned routing for equipment exceeding the GIC diagram. These diagrams are shown in appendix B.

(a) (U) FOG-M and LRSM. Each system meets the GIC clearance diagram for unrestricted rail transport worldwide.

(b) (U) Effectiveness. There is no preferred system because all are equally transportable by rail worldwide.

(4) (U) OCONUS Rail Restrictions/Constraints. Limited information is available on rail networks outside of NATO countries. However, MTMCTEA has access to rail clearance diagrams from Saudi Arabia (see appendix B). These clearance diagrams are somewhat dated (1983), but serve as analytical tools to determine dimensional restrictions military equipment might encounter during rail movement. The larger Saudi Arabian rail clearance diagram allows for rail transport on a network of strategic rail lines in Saudi Arabia (similar to U.S. STRACNET). It should be noted that after action reports show limited rail shipments of military equipment in Saudi Arabia during Desert Shield/Storm because of a lack of railcars of sufficient capacity and/or quantity to accommodate military equipment. Specific information on rail service in other non-NATO countries is not available; however, rail assets of sufficient capacity and quantity may also not be available. Movement must be coordinated with host nation officials.

(a) (U) FOG-M and LRSM. Each system is capable of unrestricted rail transport worldwide.

(b) (U) Effectiveness. There is no preferred system because all are equally transportable by rail worldwide.

(5) (U) LOTS. LOTS operations involve transferring military equipment and supplies from cargo vessels offshore in support of military forces ashore. Army landing craft include the lighter amphibious resupply cargo (LARC)-LX, landing craft mechanized (LCM-8), and landing craft utility (LCU)-1466, -1646, and -2000 class.

(a) (U) FOG-M and LRSM. All systems can be transported on the LARC-LX and larger vessels.

(b) (U) Effectiveness. There is no preferred system because all are equally transportable by Army landing craft.

(6) (U) Intratheater Unit Movement (Required transportation assets by type and quantity for the base case and both alternatives).

Actual intratheater deployment times are difficult to predict and can be extended due to adverse circumstances. Since the alternatives are so close in transport requirements, intratheater deployment times will be similar for all three forces in both the heavy and light brigade configurations. The force requiring the least number of transport assets will be considered the most effective.

(a) Deployment by Highway. The optimum outcome is to have the fewest transport requirements for intratheater deployment. Tables 5.6 and 5.7 summarizes transport asset requirements to deploy the forces via intratheater motor/convoy (roadmarch) movement. It should be noted that M870s are organic to construction units and may not be available for tactical deployments, and also that the differences between the M870 equivalents and the M916/M172A1 combination are insignificant for the purposes of this analysis.

1. (U) Base Case. The base case heavy brigade requires 329 HETS and 110 M870 equivalents in addition to the self propelled and towed convoy vehicles. The base case light brigade requires 49 M870 equivalents in addition to the convoy vehicles.

2. (U) FOG-M. The alternative one heavy brigade requires 329 HETS and 111 M870 equivalents in addition to the convoy vehicles. The alternative one light brigade requires 50 M870 equivalents in addition to the convoy vehicles.

3. (U) LRSM. The alternative two heavy brigade requires 342 HETS and 115 M870 equivalents in addition to the convoy vehicles. The alternative two light brigade requires 50 M870 equivalents in addition to the convoy vehicles.

4. (U) Effectiveness. The differences between the base case and the two alternatives are insignificant for intratheater motor/convoy transport requirements. Deployment to the tactical assembly area will be the same for all three forces for both the heavy and light brigades.

6. (U) Conclusions. Although, there is no difference in the transportability restrictions/constraints between the FOG-M and LRSM LT, the LRSM hvY experiences restrictions for highway and air transport modes. Therefore, the FOG-M is the preferred system in the heavy brigade scenario. In the light brigade scenario the FOG-M and LRSM are equally transportable.

The differences in deployability of the base case and alternative forces is small. However, the base case requires the fewest transport assets to deploy. Of the alternatives, alternative 1 is the more deployable force since it requires the fewest transport assets in the heavy brigade scenario.

(a) (U) IntraCONUS Movement.

(1) (U) For intraCONUS movement, the FOG-M and LRSM LT encounter no restrictions for highway and rail transport. The LRSM HVY, when transported by the M916/M172A1 combination, will require permits in all states for highway transport. The LRSM HVY is capable of unrestricted rail transport in CONUS.

TABLE 5.6
INTRATHEATER HIGHWAY REQUIREMENTS (HEAVY BDE)

Force	Highway/Convoy Transport Assets			
	M870 (METS)	HETS	CONVOY (SP)	CONVOY TOWED
Base Case	110	329	473	266
FOG-M	111	329	508	267
LRSM	115	342	486	270
Legend: METS: Medium Equipment Transporters HETS: Heavy Equipment Transporters SP: Self Propelled FOG-M: Fiber Optic Guided Missile LRSM: Long Range Smart Mortar				

TABLE 5.7
INTRATHEATER HIGHWAY REQUIRMENTS (LIGHT BDE)

Force	Highway/Convoy Transport Assets			
	M870 (METS)	HETS	CONVOY (SP)	CONVOY TOWED
Base Case	49	-	143	51
FOG-M	50	-	178	52
LRSM	50	-	178	64
Legend: METS: Medium Equipment Transporters HETS: Heavy Equipment Transporters SP: Self Propelled FOG-M: Fiber Optic Guided Missile LRSM: Long Range Smart Mortar				

(2) (U) The base case requires the fewest assets for highway and rail deployment in CONUS. Of the alternatives, alternative 1 requires fewer transportation assets.

(b) (U) Intertheater Movement.

(1) (U) For intertheater movement, the FOG-M and LRSM LT encounter no restrictions for air transport. The LRSM HVY requires reduction in height and width (see table 5.3) for C-141 transport. There are no restrictions for marine transport of these systems.

(2) (U) The base case and each alternative require the same number of FSS or Large Medium-Speed RORO ships to deploy. The base case requires fewer C-141 and C-5 aircraft sorties to deploy than either alternative. Alternative 1 requires fewer C-141 and C-5 aircraft sorties than alternative 2.

(c) (U) Intratheater Movement.

(1) (U) For intratheater movement, the FOG-M encounters no restrictions for highway transport. While the LRSM LT is capable of unrestricted highway transport, the LRSM HVY will encounter significant restrictions that may require circuitous routing. Unlike the FOG-M and LRSM LT, the LRSM HVY requires reduction for C-130 transport and is not transportable by UH-60 or CH-47 helicopters. All systems are capable of unrestricted rail transport.

(2) (U) Although the base case requires the fewest transportation assets for motor/convoy, the differences between it and the alternatives are insignificant.

APPENDIX A

(U) TABLE OF ORGANIZATION AND EQUIPMENT

BASE CASE

(HEAVY)

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

1

INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 810

2 Multiples of Unit in Force

Item	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		32		43	40	40	48	382	1	32
M0990	02	CARRIER: MORTAR SY	M1064		6	NR	210	106	80	27635	927	83	155
8234	02	CARRIER PERSONNEL	M113A3		17	NR	208	100	81	23880	2456	203	414
L32887	02	CLEAVER STM WHL MT	NONE		1	R	100	72	89	2780	50	1	9
D11538	02	CARRIER COND P FTR	M577A1		5	NR	192	100	104	22415	667	56	144
6896	04	COMBAT VEH IMP TOW	M901A1		12	NR	189	100	102	30000	1575	180	335
9242	03	COMP RCP AIR PUR D	C-20X-80/6		1		65	25	40	610	11		1
F40375	01	FIGHTING VEHICLE H	M2A2		58	NR	258	140	120	65692	14548	1905	3637
0462	01	FIGHTING VEHICLE F	M3A1		2	NR	258	126	117	48896	452	49	110
0530	01	FIGHTING VEHICLE H	M3A2		4	NR	258	140	120	66027	1003	132	251
G11966	01	GEN SET: DED SKD M	MEP 802A		1		50	32	36	825	11		1
135813	01	GEN SET DED SKW	MEP 002A		1		51	32	36	940	11		1
4862	16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450	13		1
128601	01	FIELD FEEDING KIT	COMPANY LV		5	R	254	91	93	5480	803	14	155
L28351	03	KITCHEN FIELD TLR	MFK75A		4	R	178	93	94	4200	460	8	90
8405	01	BMS-120TOMEDLTNORT	K6A1		6	R	95	60	45	720	238	2	22
4154	02	RANGE OUTFIT FIELD	M59		8		27	24	42	253	36	1	3
R50681	04	RECOVERY VEH FTRAC	M88A1		7	NR	323	144	124	107840	2261	377	584
56742	02	REEL EQUIPMENT		STAND	68		6	24	36	32	68	1	5
3399	04	SANITATION CENTER		DRAIN TABLE	4		49	27	38	41	37		3
33399	08	SANITATION CENTER		WORK TABLE	4		56	26	38	57	40		3
T00161	01	TEST STAND ENGINE	NONE		1		92	48	23	666	31		1
0474	01	SHELTER SYS TLR MT	M51		2	R	168	85	96	5360	198	5	40
89518	02	TRUCK CARGO 10T 8X	M977WMM		5	R	401	96	101	38800	1337	97	281
T59278	02	TRUCK CARGO 10 T 8	M977 WMM		8	R	401	96	101	38800	2139	155	450
61494	04	TRK UTIL CRG/TRP C	M998		32	R	181	84	53	5280	3379	84	373
3093	02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
T87243	02	TRK TANK 2500 GAL	M978 WMM		8	R	401	96	101	38165	2139	153	450
18441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
8441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V48441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
132593	02	SHOP EQUIP AUTHV L		MULTIPLE ITEMS	5		70	40	36	1002	97	3	7
32730	01	SHOP EQUIP AUTHV L	S/E AUTO C		1		167	87	84	4460	101	2	18
18391	04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	119	4	24
165747	05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
8825	23	TRAILER TANK WATER	M149A2		10	R	162	81	81	2912	911	15	154
30009	02	TRUCK CARGO 2 1/2	M35A2		2	R	265	96	81	13180	353	13	60
X40146	02	TRUCK CARGO 2-1/2	M35A2 WMM		6	R	279	96	81	13570	1116	41	188
160794	15	TRK CGO D/S 5 TON	M923A1		4	R	311	97	94	22175	838	44	164
06157	01	ARMED MAINTENANCE V	NONE		6	NR	283	117	116	56000	1380	168	333
Z36068	01	TRAILER CARGO 2 1/	LMTV		34	R	209	96	58	2491	4737	42	572

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

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INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 810

2 Multiples of Unit in Force

LN	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
10337	08	TRUCK CARGO 5 TON	MTV LWB W/		4	R	352	96	102	33613	939	67	199
240430	02	TRUCK CARGO 2 1/2	4X4 LMTV W		32	R	254	96	102	24013	5419	384	1151
00712	01	TRLR CGO MTV W/DPS	NONE		21	R	220	96	58	4733	3080	50	372
03558	08	TRUCK CARGO MTV LW	W/MHE W/E		10	R	386	96	102	37314	2573	187	547
294047	02	TRUCK TANK	POL MTV W/		7	R	314	96	102	26130	1465	91	311
294433	02	TRUCK WRECKER	MTV W/W W/		1	R	352	96	102	34826	235	17	50
2222X	99	Total Accompanying Supply	--							177674	1111	89	222
2222Y	99	Total Ammunition	-----							10287	25	5	5
22222	99	Total Aggregate TOE *	---							233308	1736	117	347
											61880	4872	12342

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

TANK BATTALION (HVV DIV)

SRC - 17375L000

Authorized Personnel Strength - 587

2 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
381 01	ANTENNA GROUP	OE-254(1)G		21		43	40	40	48	251	1	21
990 02	CARRIER: MORTAR SY	M1064		6	NR	210	106	80	27635	927	83	155
234 02	CARRIER PERSONNEL	M113A3		13	NR	208	100	81	23880	1878	155	317
887 02	CLEANER STN WHL MT	NONE		1	R	100	72	89	2780	50	1	9
538 02	CARRIER COND P FTR	M577A1		5	NR	192	100	104	22415	667	56	144
242 03	COMP RCP AIR PWR D	C-20X-80/6		1		65	25	40	610	11		1
485 01	FEEDER SYS ELECT	3PH 40AMP		2		60	36	36	400	30		2
621 01	FEEDER SYS ELECT	3PH 100AMP		1		84	48	48	700	28		3
530 01	FIGHTING VEHICLE H	M3A2		6	NR	258	140	120	66027	1505	198	376
813 01	GEN SET DED 5KW	MEP 002A		2		51	32	36	940	23	1	2
862 16	HEATER DUCT TYPE P	V867-GFC3		1		56	33	55	450	13		1
601 01	FIELD FEEDING KIT	COMPANY LV		4	R	254	91	93	5480	642	11	124
351 03	KITCHEN FIELD TLR	MFK75A		3	R	178	93	94	4200	345	6	68
405 01	BMS-120TOWEDLTWORT	K6A1		6	R	95	60	45	720	238	2	22
154 02	RANGE OUTFIT FIELD	M59		6		27	24	42	253	27	1	2
681 04	RECOVERY VEH FTRAC	M88A1		7	NR	323	144	124	107840	2261	377	584
742 02	REEL EQUIPMENT		STAND	38		6	24	36	32	38	1	3
399 04	SANITATION CENTER		DRAIN TABLE	3		49	27	38	41	28		2
399 08	SANITATION CENTER		WORK TABLE	3		56	26	38	57	30		2
161 01	TEST STAND ENGINE	NONE		1		92	48	23	666	31		1
474 01	SHELTER SYS TLR MT	M51		2	R	168	85	96	5360	198	5	40
518 02	TRUCK CARGO 10T 8X	M977WMM		5	R	401	96	101	38800	1337	97	281
278 02	TRUCK CARGO 10 T 8	M977 WOWN		10	R	401	96	101	38800	2673	194	563
494 04	TRK UTIL CRG/TRP C	M998		30	R	181	84	53	5280	3167	79	350
093 02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
243 02	TRK TANK 2500 GAL	M978 WOWN		23	R	401	96	101	38165	6149	439	1294
883 02	TRAILER FLATBED 5	M1061A1		1	R	223	98	40	5850	152	3	13
141 53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475	61		7
141 54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800	18		2
950 01	TANK UNIT LIQ DSPH TK LIQ DIS			1		73	61	56	410	31		4
441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
730 01	SHOP EQUIP AUTHV L S/E AUTO C			1		167	87	84	4460	101	2	18
391 04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	119	4	24
747 05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
811 02	TRAILER CARGO 1-1/	M105A2		19	R	166	83	55	2670	1818	25	208
825 23	TRAILER TANK WATER	M149A2		8	R	162	81	81	2912	729	12	123
009 02	TRUCK CARGO 2 1/2	M35A2		22	R	265	96	81	13180	3887	145	656
146 02	TRUCK CARGO 2-1/2	M35A2 WMM		5	R	279	96	81	13570	930	34	157
1794 15	TRK CGO D/S 5 TON	M923A1		5	R	311	97	94	22175	1047	55	205

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

TANK BATTALION (HVV DIV)

SRC - 17375L000

Authorized Personnel Strength - 587

2 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
157 01	ARMED MAINTENANCE V NONE			4	NR	283	117	116	56000	920	112	222
130 02	TRUCK CARGO 2 1/2 4X4 LMTV W			4	R	254	96	102	24013	677	48	144
158 04	TANK COMBAT FULL T M1A1E2			58	NR	360	144	114	123780	20880	3590	4959
133 02	TRUCK WRECKER MTV W/W W/			1	R	352	96	102	34826	235	17	50
12X 99	Total Accompanying Supply --								128758	805	64	161
12Y 99	Total Ammunition -----								7455	18	4	4
12Z 99	Total Aggregate TOE * ---								188749	1276	94	255
										56623	5944	11641

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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MHC INF DIV (MECH) BDE

SRC - 87042L200

Authorized Personnel Strength - 85

1 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381 01	ANTENNA GROUP	OE-254(1)G		11		43	40	40	48	131		11
234 02	CARRIER PERSONNEL	M113A3		1	NR	208	100	81	23880	144	12	24
2887 02	CLEANER STM WNL MT	NONE		1	R	100	72	89	2780	50	1	9
D11538 02	CARRIER COMD P FTR	M577A1		1	NR	192	100	104	22415	133	11	29
E55553 01	DISTR/ILLUM SET EL	1PH/60AMP		1		60	36	36	400	15		1
966 01	GEN SET: DED SKD M	MEP 802A		2		50	32	36	825	22	1	2
3404 02	RADIO SET HIGH FRE		RADIO	2		27	20	40	130	8		1
J35813 01	GEN SET DED 5KW	MEP 002A		1		51	32	36	940	11		1
862 16	HEATER DUCT TYPE P	V867-GFC3		1		56	33	55	450	13		1
601 01	FIELD FEEDING KIT	COMPANY LV		1	R	254	91	93	5480	161	3	31
L28351 03	KITCHEN FIELD TLR	MFK75A		1	R	178	93	94	4200	115	2	23
4154 02	RANGE OUTFIT FIELD	M59		2		27	24	42	253	9		1
544 02	RECOVERY VEH FTRAC	M578		1	NR	254	124	115	49320	219	25	52
33399 04	SANITATION CENTER		DRAIN TABLE	1		49	27	38	41	9		1
33399 08	SANITATION CENTER		WORK TABLE	1		56	26	38	57	10		1
494 04	TRK UTIL CRG/TRP C	M998		14	R	181	84	53	5280	1478	37	163
2141 53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475	61		7
V12141 54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800	18		2
441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V48441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
V32593 02	SHOP EQUIP AUTMV L		MULTIPLE ITEMS	1		70	40	36	1002	19	1	1
5747 05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
75400 13	TRAILER CARGO 1/4	M416A1		2	R	108	61	43	620	92	1	8
V95811 02	TRAILER CARGO 1-1/	M105A2		1	R	166	83	55	2670	96	1	11
825 23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
0146 02	TRUCK CARGO 2-1/2	M35A2 WMM		1	R	279	96	81	13570	186	7	31
X40831 20	TRK CGO 5 TON LWB	M924A1		1	R	311	97	94	22070	209	11	41
0833 02	TRUCK UTILITY 1/4	M151A2		2	R	132	64	53	2450	117	2	13
5068 01	TRAILER CARGO 2 1/	LMTV		1	R	209	96	58	2491	139	1	17
240430 02	TRUCK CARGO 2 1/2	4X4 LMTV W		3	R	254	96	102	24013	508	36	108
72222X 99	Total Accompanying Supply	--							18645	117	9	23
222Y 99	Total Ammunition	-----							1080	3	1	1
22222Z 99	Total Aggregate TOE *	---							37311	272	19	54
										4560	186	689

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

BASE CASE

(LIGHT)

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

1

INF BN (LIGHT)

SRC - 07015L000

Authorized Personnel Strength - 551

3 Multiples of Unit in Force

	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		15		43	40	40	48	179		15
68966	01	DRUM FABRIC FUEL	500 GAL CA		2		74	35	18	233	36		1
6742	02	REEL EQUIPMENT		STAND	25		6	24	36	32	25		2
100474	01	SHELTER SYS TLR MT M51			2	R	168	85	96	5360	198	5	40
T05096	01	TRK UTIL TOW CAR 1 M966			4	R	180	85	74	7195	425	14	66
8844	01	TRK AMB 4 LITTER 4 M997			4	R	204	86	101	7500	487	15	103
1494	04	TRK UTIL CRG/TRP C M998			23	R	181	84	53	5280	2428	61	268
T61562	04	TRK UTIL CGO/TRP C M1038 W/W			4	R	179	84	53	5200	418	10	46
5537	02	TRAILER CARGO 3/4 M101A1			3	R	147	74	50	1350	227	2	24
ZZZX	99	Total Accompanying Supply	--							120862	756	60	151
ZZZZZY	99	Total Ammunition	-----							6998	17	3	3
ZZZZZZ	99	Total Aggregate TOE *	---							60561	456	30	91
											5652	203	810

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

2

HMC INF DIV BDE (LID)

SRC - 77042L000

Authorized Personnel Strength - 131

1 Multiples of Unit in Force

NOX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons	
A79381 01	ANTENNA GROUP	OE-254(1)G		13		43	40	40	48	155		13	
32887 02	CLEANER STM WML MT	NONE		1	R	100	72	89	2780	50	1	9	
5553 01	DISTR/ILLUM SET EL	1PH/60AMP		4		60	36	36	400	60	1	5	
611966 01	GEN SET: DED SKD M	MEP 802A		4		50	32	36	825	44	2	3	
H35404 02	RADIO SET HIGH FRE		RADIO	2		27	20	40	130	8		1	
4862 16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450	13		1	
8601 01	FIELD FEEDING KIT	COMPANY LV		14	R	254	91	93	5480	2247	38	435	
L28351 03	KITCHEN FIELD TLR	MFK75A		7	R	178	93	94	4200	805	15	158	
4154 02	RANGE OUTFIT FIELD	M59		14		27	24	42	253	63	2	6	
3399 04	SANITATION CENTER		DRAIN TABLE	7		49	27	38	41	64		5	
S33399 08	SANITATION CENTER		WORK TABLE	7		56	26	38	57	71		6	
T07679 01	TRK UTIL, NVY HMMWV	M1097		6	R	191	86	72	5600	684	17	103	
1494 04	TRK UTIL CRG/TRP C	M998		22	R	181	84	53	5280	2323	58	256	
V49950 01	TANK UNIT LIQ DSPN	TK LIQ DIS		1		73	61	56	410	31		4	
V48441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1	
8441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1	
8441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2	
M32730 01	SHOP EQUIP AUTMV L	S/E AUTO C		1		167	87	84	4460	101	2	18	
M5537 02	TRAILER CARGO 3/4	M101A1		4	R	147	74	50	1350	302	3	31	
5811 02	TRAILER CARGO 1-1/	M105A2		2	R	166	83	55	2670	191	3	22	
098825 23	TRAILER TANK WATER	M149A2		7	R	162	81	81	2912	638	10	108	
740439 02	TRUCK CARGO 5 TON	MTV W/E		10	R	275	96	102	32207	1833	161	390	
0712 01	TLR CGO MTV W/DPS	NONE		1	R	220	96	58	4733	147	2	18	
2222X 99	Total Accompanying Supply	--							28735	180	14	36	
2222Z 99	Total Ammunition	-----							1664	4	1	1	
2222 99	Total Aggregate TOE *	---							53533	424	27	85	
											10526	359	1716

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

ALTERNATIVE 1

(HEAVY)

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

1

INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 826

2 Multiples of Unit in Force

MDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381 01	ANTENNA GROUP	OE-254(1)G		32		43	40	40	48	382	1	32
0990 02	CARRIER: MORTAR SY	M1064		6	NR	210	106	80	27635	927	83	155
03234 02	CARRIER PERSONNEL	M113A3		17	NR	208	100	81	23880	2456	203	414
C32887 02	CLEANER STM WNL MT	NONE		1	R	100	72	89	2780	50	1	9
011538 02	CARRIER COMD P FTR	M577A1		5	NR	192	100	104	22415	667	56	144
05896 04	COMBAT VEN IMP TOW	M901A1		12	NR	189	100	102	30000	1575	180	335
009242 03	COMP RCP AIR PWR D	C-20X-80/6		1		65	25	40	610	11		1
F40375 01	FIGHTING VEHICLE H	M2A2		58	NR	258	140	120	65692	14548	1905	3637
00462 01	FIGHTING VEHICLE F	M3A1		2	NR	258	126	117	48896	452	49	110
00530 01	FIGHTING VEHICLE H	M3A2		4	NR	258	140	120	66027	1003	132	251
G11966 01	GEN SET: DED SKD H	MEP 802A		1		50	32	36	825	11		1
005813 01	GEN SET DED SKW	MEP 002A		1		51	32	36	940	11		1
004862 16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450	13		1
K28601 01	FIELD FEEDING KIT	COMPANY LV		5	R	254	91	93	5480	803	14	155
L28351 03	KITCHEN FIELD TLR	MFK75A		4	R	178	93	94	4200	460	8	90
00405 01	BNS-120TOMEDLTORT	K6A1		6	R	95	60	45	720	238	2	22
004154 02	RANGE OUTFIT FIELD	M59		8		27	24	42	253	36	1	3
M50681 04	RECOVERY VEN FTRAC	M88A1		7	NR	323	144	124	107840	2261	377	584
006742 02	REEL EQUIPMENT		STAND	68		6	24	36	32	68	1	5
003399 04	SANITATION CENTER		DRAIN TABLE	4		49	27	38	41	37		3
S33399 08	SANITATION CENTER		WORK TABLE	4		56	26	38	57	40		3
T00161 01	TEST STAND ENGINE	NONE		1		92	48	23	666	31		1
00474 01	SHELTER SYS TLR MT	M51		2	R	168	85	96	5360	198	5	40
T59518 02	TRUCK CARGO 10T 8X	M977A1M		5	R	401	96	101	38800	1337	97	281
T59278 02	TRUCK CARGO 10 T 8	M977 WMM		8	R	401	96	101	38800	2139	155	450
001494 04	TRK UTIL CRG/TRP C	M998		32	R	181	84	53	5280	3379	84	373
003093 02	TRUCK WRECKER 8X3	M984 W/W		1	R	384	101	101	43180	269	22	57
T87243 02	TRK TANK 2500 GAL	M978 WMM		8	R	401	96	101	38165	2139	153	450
00441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
00441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V48441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
M52593 02	SHOP EQUIP AUTMV L		MULTIPLE ITEMS	5		70	40	36	1002	97	3	7
002730 01	SHOP EQUIP AUTMV L	S/E AUTO C		1		167	87	84	4460	101	2	18
M58391 04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	119	4	2
M65747 05	TOOL KIT VEN FTRAC		WELDER	1		64	37	37	1130	16	1	1
00825 23	TRAILER TANK WATER	M149A2		10	R	162	81	81	2912	911	15	154
00009 02	TRUCK CARGO 2 1/2	M35A2		2	R	265	96	81	13180	353	13	60
X40146 02	TRUCK CARGO 2-1/2	M35A2 WMM		6	R	279	96	81	13570	1116	41	188
00794 15	TRK CGO D/S 5 TON	M923A1		4	R	311	97	94	22175	838	44	164
006157 01	ARMED MAINTENANCE V	NONE		6	NR	283	117	116	56000	1380	168	333
Z36068 01	TRAILER CARGO 2 1/	LMTV		34	R	209	96	58	2491	4737	42	572

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 826

2 Multiples of Unit in Force

MDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
240337 08	TRUCK CARGO 5 TON	MTV LMB W/		4	R	352	96	102	33613	939	67	199
0430 02	TRUCK CARGO 2 1/2	4X4 LMTV W		32	R	254	96	102	24013	5419	384	1151
0712 01	TRLR CGO MTV W/DPS	NONE		21	R	220	96	58	4733	3080	50	372
293558 08	TRUCK CARGO MTV LV	W/MNE W/E		10	R	386	96	102	37314	2573	187	547
204047 02	TRUCK TANK	POL MTV W/		7	R	314	96	102	26130	1465	91	311
4433 02	TRUCK WRECKER	MTV W/V W/		1	R	352	96	102	34826	235	17	50
2222X 99	Total Accompanying Supply	--							177674	1111	89	222
2222Y 99	Total Ammunition	-----							10287	25	5	5
2222 99	Total Aggregate TOE *	---							233308	1736	117	347
										61880	4872	12342

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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alt one nles heavy

SRC - 07348T200

Authorized Personnel Strength - 57

1 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381 01	ANTENNA GROUP	OE-254(1)G		5		43	40	40	48	60		5
1742 02	REEL EQUIPMENT		STAND	15		6	24	36	32	15		1
7679 01	TRK UTIL, Hvy H98WV	M1097		12	R	191	86	72	5600	1369	34	205
T39518 02	TRUCK CARGO 10T 8X	M977WJN		3	R	401	96	101	38800	802	58	169
T61494 04	TRK UTIL CRG/TRP C	M998		5	R	181	84	53	5280	528	13	58
3093 02	TRUCK WRECKER 8X8	M984 W/V		1	R	384	101	101	43180	269	22	57
107243 02	TRK TANK 2500 GAL	M978 WJN		1	R	401	96	101	38165	267	19	56
T92242 01	TRK UTILITY 1-1/4	M1025		12	R	180	85	74	6104	1275	37	197
3825 23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
1430 02	TRUCK CARGO 2 1/2	4X4 LMTV W		1	R	254	96	102	24013	169	12	36
ZZZZZZ 99	Total Aggregate TOE *	---							13808	115	7	23
										4960	203	822

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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TANK BATTALION (NAVY DIV)

SRC - 17375L000

Authorized Personnel Strength - 587

2 Multiples of Unit in Force

Item	MDX	Nomenclature	Model	Component Description	Auth Qty	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		21	43	40	40	48	251	1	21
0990	02	CARRIER: MORTAR SY	N1064		6	NR	210	106	80	27635	83	155
8234	02	CARRIER PERSONNEL	N113A3		13	NR	208	100	81	23880	155	317
C32887	02	CLEANER STM WML MT	NONE		1	R	100	72	89	2780	1	9
A11538	02	CARRIER COND P FTR	N577A1		5	NR	192	100	104	22415	56	144
9242	03	COMP RCP AIR PWR D	C-20X-80/6		1		65	25	40	610		1
55485	01	FEEDER SYS ELECT	3PH 40AMP		2		60	36	36	400		2
555621	01	FEEDER SYS ELECT	3PH 100AMP		1		84	48	48	700		3
0530	01	FIGHTING VEHICLE M	M3A2		6	NR	258	140	120	66027	198	376
5813	01	GEN SET DED SKW	MEP 002A		2		51	32	36	940	1	2
K24862	16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450		1
0601	01	FIELD FEEDING KIT	COMPANY LV		4	R	254	91	93	5480	11	124
8351	03	KITCHEN FIELD TLR	NFK75A		3	R	178	93	94	4200	6	68
8405	01	BMS-120TOWEDLTWORT	K6A1		6	R	95	60	45	720	2	22
R14154	02	RANGE OUTFIT FIELD	N59		6		27	24	42	253	1	2
0681	04	RECOVERY VEN FTRAC	N88A1		7	NR	323	144	124	107840	377	584
6742	02	REEL EQUIPMENT		STAND	38		6	24	36	32	1	3
833399	04	SANITATION CENTER		DRAIN TABLE	3		49	27	38	41		2
3399	08	SANITATION CENTER		WORK TABLE	3		56	26	38	57		2
0161	01	TEST STAND ENGINE	NONE		1		92	48	23	666		1
T00474	01	SHELTER SYS TLR MT	N51		2	R	168	85	96	5360	5	40
79518	02	TRUCK CARGO 10T BX	N977WAM		5	R	401	96	101	38800	97	281
9278	02	TRUCK CARGO 10 T 8	N977 WOWN		10	R	401	96	101	38800	194	563
T61494	04	TRK UTIL CRG/TRP C	N998		30	R	181	84	53	5280	79	350
T63093	02	TRUCK WRECKER 8X8	N984 W/W		1	R	384	101	101	43180	22	57
7243	02	TRK TANK 2500 GAL	N978 WOWN		23	R	401	96	101	38165	439	1294
6883	02	TRAILER FLATBED 5	N1061A1		1	R	223	98	40	5850	3	13
V12141	53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475		7
2141	54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800		2
9950	01	TANK UNIT LIQ DSPN	TK LIQ DIS		1		73	61	56	410		4
V48441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605		1
48441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615		1
8441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274		2
52730	01	SHOP EQUIP AUTHV L	S/E AUTO C		1		167	87	84	4460	2	18
48391	04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	4	24
5747	05	TOOL KIT VEN FTRAC		WELDER	1		64	37	37	1130	1	1
5811	02	TRAILER CARGO 1-1/	N105A2		19	R	166	83	55	2670	25	208
W98825	23	TRAILER TANK WATER	N149A2		8	R	162	81	81	2912	12	123
0009	02	TRUCK CARGO 2 1/2	N35A2		22	R	265	96	81	13180	145	656
0146	02	TRUCK CARGO 2-1/2	N35A2 WAM		5	R	279	96	81	13570	34	157
X40794	15	TRK CGO D/S 5 TON	N923A1		5	R	311	97	94	22175	55	205

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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TANK BATTALION (HVV DIV)
SRC - 17375L000
Authorized Personnel Strength - 587
2 Multiples of Unit in Force

NDX	Nomenclature	Model	Component	Auth	Length	Width	Height	Weight	Square	Short	Measure	
			Description	Qty								Veh
206157 01	ARMED MAINTENANCE V	NONE		4	NR	283	117	116	56000	920	112	222
0430 02	TRUCK CARGO 2 1/2 4X4	LMTV W		4	R	254	96	102	24013	677	48	144
7258 04	TANK COMBAT FULL T	M1A1E2		58	NR	360	144	114	123780	20880	3590	4959
294433 02	TRUCK WRECKER	MTV W/W W/		1	R	352	96	102	34826	235	17	50
72222X 99	Total Accompanying Supply	--							128758	805	64	161
7222Y 99	Total Ammunition	-----							7455	18	4	4
72222Z 99	Total Aggregate TOE *	---							188749	1276	94	255
										56623	5944	11641

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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MNC INF DIV (MECH) BDE

SRC - 87042L200

Authorized Personnel Strength - 85

1 Multiples of Unit in Force

N	NOX	Nomenclature	Model	Component Description	Auth Qty	Length Veh (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		11	43	40	40	48	131		11
A18234	02	CARRIER PERSONNEL	M113A3		1	NR	208	100	81	23880	12	24
2887	02	CLEANER STM WML MT	NONE		1	R	100	72	89	2780	1	9
U11538	02	CARRIER COMD P FTR	M577A1		1	NR	192	100	104	22415	11	29
F55553	01	DISTR/ILLUM SET EL	1PH/60AMP		1		60	36	36	400		1
1966	01	GEN SET: DED SKD M	MEP 802A		2		50	32	36	825	1	2
5404	02	RADIO SET HIGH PRE		RADIO	2		27	20	40	130		1
J35813	01	GEN SET DED SKW	MEP 002A		1		51	32	36	940		1
4862	16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450		1
8601	01	FIELD FEEDING KIT	COMPANY LV		1	R	254	91	93	5480	3	31
L28351	03	KITCHEN FIELD TLR	MPK75A		1	R	178	93	94	4200	2	23
R14154	02	RANGE OUTFIT FIELD	M59		2		27	24	42	253		1
0544	02	RECOVERY VEN FTRAC	M578		1	NR	254	124	115	49320	25	52
33399	04	SANITATION CENTER		DRAIN TABLE	1		49	27	38	41		1
33399	08	SANITATION CENTER		WORK TABLE	1		56	26	38	57		1
1494	04	TRK UTIL CRG/TRP C	M998		14	R	181	84	53	5280	37	163
2141	53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475		7
V12141	54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800		2
8441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605		1
8441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615		1
8441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274		2
32593	02	SHOP EQUIP AUTMV L		MULTIPLE ITEMS	1		70	40	36	1002	1	1
5747	05	TOOL KIT VEN FTRAC		WELDER	1		64	37	37	1130	1	1
95400	13	TRAILER CARGO 1/4	M416A1		2	R	108	61	43	620	1	8
95811	02	TRAILER CARGO 1-1/	M105A2		1	R	166	83	55	2670	1	11
8825	23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	1	15
0146	02	TRUCK CARGO 2-1/2	M35A2 WAM		1	R	279	96	81	13570	7	31
X40831	20	TRK CGO 5 TON LMB	M924A1		1	R	311	97	94	22070	11	41
0633	02	TRUCK UTILITY 1/4	M151A2		2	R	132	64	53	2450	2	13
6068	01	TRAILER CARGO 2 1/	LMTV		1	R	209	96	58	2491	1	17
240430	02	TRUCK CARGO 2 1/2	4X4 LMTV W		3	R	254	96	102	24013	36	108
72222X	99	Total Accompanying Supply	--							18645	9	23
7222Y	99	Total Ammunition	-----							1080	1	1
7222Z	99	Total Aggregate TOE *	---							37311	19	54
										4560	186	689

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

ALTERNATIVE 1

(LIGHT)

INF BN (LIGHT)

SRC - 07015L000

Authorized Personnel Strength - 551

3 Multiples of Unit in Force

M	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
9381	01	ANTENNA GROUP	OE-254(1)G		15		43	40	40	48	179		15
8966	01	DRUM FABRIC FUEL	500 GAL CA		2		74	35	18	233	36		1
6742	02	REEL EQUIPMENT		STAND	25		6	24	36	32	25		2
0474	01	SHELTER SYS TLR MT M51			2	R	168	85	96	5360	198	5	40
5096	01	TRK UTIL TOM CAR 1 M966			4	R	180	85	74	7195	425	14	66
8844	01	TRK AMB 4 LITTER 4 M997			4	R	204	86	101	7500	487	15	103
1494	04	TRK UTIL CRG/TRP C M998			23	R	181	84	53	5280	2428	61	268
1562	04	TRK UTIL CGO/TRP C M1038 W/W			4	R	179	84	53	5200	418	10	46
5537	02	TRAILER CARGO 3/4 M101A1			3	R	147	74	50	1350	227	2	24
ZZZX	99	Total Accompanying Supply	--							120862	756	60	151
ZZZY	99	Total Ammunition	-----							6998	17	3	3
ZZZZ	99	Total Aggregate TOE *	---							60561	456	30	91
											5652	203	810

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

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UNIT EQUIPMENT LIST

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NLOS CA COMPANY (L10)
SRC - 073487200
Authorized Personnel Strength - 57
1 Multiple of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
181 01	ANTENNA GROUP	OE-254(1)G		5		43	40	40	48	60		5
142 02	REEL EQUIPMENT		STAND	15		6	24	36	32	15		1
179 01	TRK UTIL, Hvy W99WV	M1097		12	R	191	86	72	5600	1369	34	205
118 02	TRUCK CARGO 10T 8X	M977WAM		3	R	401	96	101	38800	802	58	169
194 04	TRK UTIL CRG/TRP C	M998		5	R	181	84	53	5280	528	13	58
193 02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
143 02	TRK TANK 2500 GAL	M978 WDM		1	R	401	96	101	38165	267	19	56
142 01	TRK UTILITY 1-1/4	M1025		12	R	180	85	74	6104	1275	37	197
125 23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
130 02	TRUCK CARGO 2 1/2	4X4 LMTV W		1	R	254	96	102	24013	169	12	36
122 99	Total Aggregate TOE *	---							11840	88	6	18
										4934	202	817

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high
and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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MHC INF DIV BDE (LID)

SRC - 77042L000

Authorized Personnel Strength - 131

1 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons	
A79381 01	ANTENNA GROUP	OE-254(1)G		13		43	40	40	48	155		13	
2887 02	CLEANER STM WNL MT NONE			1	R	100	72	89	2780	50	1	9	
5553 01	DISTR/ILLUM SET EL 1PH/60AMP			4		60	36	36	400	60	1	5	
G11966 01	GEN SET: DED SKD M NEP 802A			4		50	32	36	825	44	2	3	
M33404 02	RADIO SET HIGH FRE		RADIO	2		27	20	40	130	8		1	
862 16	HEATER DUCT TYPE P VB67-GFC3			1		56	33	55	450	13		1	
26601 01	FIELD FEEDING KIT COMPANY LV			14	R	254	91	93	5480	2247	38	435	
L28351 03	KITCHEN FIELD TLR MFK75A			7	R	178	93	94	4200	805	15	158	
154 02	RANGE OUTFIT FIELD M59			14		27	24	42	253	63	2	6	
399 04	SANITATION CENTER		DRAIN TABLE	7		49	27	38	41	64		5	
33399 08	SANITATION CENTER		WORK TABLE	7		56	26	38	57	71		6	
7679 01	TRK UTIL, HVY M99LV M1097			6	R	191	86	72	5600	684	17	103	
1494 04	TRK UTIL CRG/TRP C M998			22	R	181	84	53	5280	2323	58	256	
V19950 01	TANK UNIT LIQ DSPN TK L2Q DIS			1		73	61	56	410	31		4	
V8441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1	
8441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1	
8441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2	
M32730 01	SHOP EQUIP AUTMV L S/E AUTO C			1		167	87	84	4460	101	2	18	
537 02	TRAILER CARGO 3/4 M101A1			4	R	147	74	50	1350	302	3	31	
5811 02	TRAILER CARGO 1-1/ M105A2			2	R	166	83	55	2670	191	3	22	
V98825 23	TRAILER TANK WATER M149A2			7	R	162	81	81	2912	638	10	108	
710439 02	TRUCK CARGO 5 TON MTV W/E			10	R	275	96	102	32207	1833	161	390	
0712 01	TRLR CGO MTV W/DPS NONE			1	R	220	96	58	4733	147	2	18	
22222X 99	Total Accompanying Supply --								28735	180	14	36	
22222Y 99	Total Ammunition -----								1664	4	1	1	
2222 99	Total Aggregate TOE * ---								53533	424	27	85	
											10526	359	1716

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

ALTERNATIVE 2

(HEAVY)

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 810

2 Multiples of Unit in Force

IN	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		32		43	40	40	48	382	1	32
0990	02	CARRIER: MORTAR SY	M1064		6	NR	210	106	80	27635	927	83	155
8234	02	CARRIER PERSONNEL	M113A3		17	NR	208	100	81	23880	2456	203	414
C32887	02	CLEANER STM WHL MT	NONE		1	R	100	72	89	2780	50	1	9
D11538	02	CARRIER COND P FTR	M577A1		5	NR	192	100	104	22415	667	56	144
6896	04	COMBAT VEH IMP TOW	M901A1		12	NR	189	100	102	30000	1575	180	335
E69242	03	COMP RCP AIR PUR D	C-20X-80/6		1		65	25	40	610	11		1
F40375	01	FIGHTING VEHICLE M	M2A2		58	NR	258	140	120	65692	14548	1905	3637
0462	01	FIGHTING VEHICLE F	M3A1		2	NR	258	126	117	48896	452	49	110
0530	01	FIGHTING VEHICLE M	M3A2		4	NR	258	140	120	66027	1003	132	251
G11966	01	GEN SET: DED SKD M	MEP 802A		1		50	32	36	825	11		1
75813	01	GEN SET DED SKW	MEP 002A		1		51	32	36	940	11		1
4862	16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450	13		1
K28601	01	FIELD FEEDING KIT	COMPANY LV		5	R	254	91	93	5480	803	14	155
L28351	03	KITCHEN FIELD TLR	MFK75A		4	R	178	93	94	4200	460	8	90
8405	01	BMS-120TOWEDLTWORT	K6A1		6	R	95	60	45	720	238	2	22
4154	02	RANGE OUTFIT FIELD	M59		8		27	24	42	253	36	1	3
R50681	04	RECOVERY VEH FTRAC	M88A1		7	NR	323	144	124	107840	2261	377	584
6742	02	REEL EQUIPMENT		STAND	68		6	24	36	32	68	1	5
3399	04	SANITATION CENTER		DRAIN TABLE	4		49	27	38	41	37		3
S33399	08	SANITATION CENTER		WORK TABLE	4		56	26	38	57	40		3
T00161	01	TEST STAND ENGINE	NONE		1		92	48	23	666	31		1
0474	01	SHELTER SYS TLR MT	M51		2	R	168	85	96	5360	198	5	40
T59518	02	TRUCK CARGO 10T 8X	M977WMM		5	R	401	96	101	38800	1337	97	281
T59278	02	TRUCK CARGO 10 T 8	M977 WMM		8	R	401	96	101	38800	2439	155	450
51494	04	TRK UTIL CRG/TRP C	M998		32	R	181	84	53	5280	3379	84	373
3093	02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
T87243	02	TRK TANK 2500 GAL	M978 WMM		8	R	401	96	101	38165	2139	153	450
8441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
8441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V48441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
12593	02	SHOP EQUIP AUTHV L		MULTIPLE ITEMS	5		70	40	36	1002	97	3	7
2730	01	SHOP EQUIP AUTHV L	S/E AUTO C		1		167	87	84	4460	101	2	18
48391	04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	119	4	24
W65747	05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
98825	23	TRAILER TANK WATER	M149A2		10	R	162	81	81	2912	911	15	154
0009	02	TRUCK CARGO 2 1/2	M35A2		2	R	265	96	81	13180	353	13	60
X40146	02	TRUCK CARGO 2-1/2	M35A2 WMM		6	R	279	96	81	13570	1116	41	188
0794	15	TRK CGO D/S 5 TON	M923A1		4	R	311	97	94	22175	838	44	164
06157	01	ARMED MAINTENANCE V	NONE		6	NR	283	117	116	56000	1380	168	333
Z36068	01	TRAILER CARGO 2 1/	LMTV		34	R	209	96	58	2491	4737	42	572

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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INF BN (MECH)

SRC - 07245L000

Authorized Personnel Strength - 810

2 Multiples of Unit in Force

	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
240337	08	TRUCK CARGO 5 TON	MTV LWB W/		4	R	352	96	102	33613	939	67	199
240430	02	TRUCK CARGO 2 1/2	4X4 LMTV W		32	R	254	96	102	24013	5419	384	1151
0712	01	TRLR CGO MTV W/DPS	NONE		21	R	220	96	58	4733	3080	50	372
293558	08	TRUCK CARGO MTV LW	W/MHE W/E		10	R	386	96	102	37314	2573	187	547
294047	02	TRUCK TANK	POL MTV W/		7	R	314	96	102	26130	1465	91	311
4433	02	TRUCK WRECKER	MTV W/W W/		1	R	352	96	102	34826	235	17	50
ZZZX	99	Total Accompanying Supply	--							177674	1111	89	222
ZZZZZY	99	Total Ammunition	-----							10287	25	5	5
ZZZZ	99	Total Aggregate TOE *	---							233308	1736	117	347
											61880	4872	12342

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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NLOS COMPANY ALT 1 MVY

SRC - 07348T000

Authorized Personnel Strength - 77

1 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381 01	ANTENNA GROUP	OE-254(1)G		6		43	40	40	48	72		6
C10990 02	CARRIER: MORTAR SY	M1064		12	NR	210	106	80	27635	1855	166	309
C1234 02	CARRIER PERSONNEL	M113A3		4	NR	208	100	81	23880	578	48	98
C1538 02	CARRIER COND P FTR	M577A1		1	NR	192	100	104	22415	133	11	29
F55553 01	DISTR/ILLUM SET EL	1PH/60AMP		1		60	36	36	400	15		1
G1966 01	GEN SET: DED SKD M	MEP 802A		1		50	32	36	825	11		1
H1742 02	REEL EQUIPMENT		STAND	15		6	24	36	32	15		1
T39518 02	TRUCK CARGO 10T 8X	M977WM		3	R	401	96	101	38800	802	58	169
T4494 04	TRK UTIL CRG/TRP C	M998		4	R	181	84	53	5280	422	11	47
V1441 02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
V1441 03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V1441 04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
V1593 02	SHOP EQUIP AUTHV L		MULTIPLE ITEMS	1		70	40	36	1002	19	1	1
V1747 05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
V98825 23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
Z1890 01	HEATER DUCT TYPE P	150000BT U		1		62	41	60	650	18		2
Z1968 01	TRAILER CARGO 2 1/	LNTV		3	R	209	96	58	2491	418	4	51
Z40430 02	TRUCK CARGO 2 1/2	4X4 LNTV W		4	R	254	96	102	24013	677	48	144
Z42313 01	RECOVERY VEHICLE	M88A1E1		1	NR	326	135	118	129000	306	65	75
Z1047 02	TRUCK TANK	POL MTV W/		1	R	314	96	102	26130	209	13	44
Z1433 02	TRUCK WRECKER	MTV W/W W/		1	R	352	96	102	34826	235	17	50
Z22222 99	Total Aggregate TOE *	---							30233	200	15	40
										6180	460	1089

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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TANK BATTALION (HVV DIV)

SRC - 17375L000

Authorized Personnel Strength - 587

2 Multiples of Unit in Force

LN	MDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A19381	01	ANTENNA GROUP	OE-254(1)G		21		43	40	40	48	251	1	21
C10990	02	CARRIER: MORTAR SY	M1064		6	MR	210	106	80	27635	927	83	155
234	02	CARRIER PERSONNEL	M113A3		13	MR	208	100	81	23880	1878	155	317
2887	02	CLEANER STM WNL MT	NONE		1	R	100	72	89	2780	50	1	9
D11538	02	CARRIER COMD P FTR	M577A1		5	MR	192	100	104	22415	667	56	144
2242	03	COMP RCP AIR PWR D	C-20X-80/6		1		65	25	40	610	11		1
485	01	FEEDER SYS ELECT	3PH 40AMP		2		60	36	36	400	30		2
F55621	01	FEEDER SYS ELECT	3PH 100AMP		1		84	48	48	700	28		3
E60530	01	FIGHTING VEHICLE H	M3A2		6	MR	258	140	120	66027	1505	198	376
813	01	GEN SET DED 5KW	MEP 002A		2		51	32	36	940	23	1	2
862	16	HEATER DUCT TYPE P	V867-GFC3		1		56	33	55	450	13		1
K28601	01	FIELD FEEDING KIT	COMPANY LV		4	R	254	91	93	5480	642	11	124
351	03	KITCHEN FIELD TLR	MFK75A		3	R	178	93	94	4200	345	6	68
405	01	BMS-120TOWEDLT MORT	K6A1		6	R	95	60	45	720	238	2	22
R14154	02	RANGE OUTFIT FIELD	M59		6		27	24	42	253	27	1	2
50681	04	RECOVERY VEN FTRAC	M88A1		7	MR	323	144	124	107840	2261	377	584
5742	02	REEL EQUIPMENT		STAND	38		6	24	36	32	38	1	3
S33399	04	SANITATION CENTER		DRAIN TABLE	3		49	27	38	41	28		2
S33399	08	SANITATION CENTER		WORK TABLE	3		56	26	38	57	30		2
161	01	TEST STAND ENGINE	NONE		1		92	48	23	666	31		1
474	01	SHELTER SYS TLR MT	M51		2	R	168	85	96	5360	198	5	40
T39518	02	TRUCK CARGO 10T 8X	M977WAM		5	R	401	96	101	38800	1337	97	281
278	02	TRUCK CARGO 10 T 8	M977 WOWN		10	R	401	96	101	38800	2673	194	563
494	04	TRK UTIL CRG/TRP C	M998		30	R	181	84	53	5280	3167	79	350
T63093	02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
T87243	02	TRK TANK 2500 GAL	M978 WOWN		23	R	401	96	101	38165	6149	439	1294
883	02	TRAILER FLATBED 5	M1061A1		1	R	223	98	40	5850	152	3	13
V12141	53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475	61		7
V12141	54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800	18		2
9950	01	TANK UNIT LIQ DSPH TK LIQ DIS			1		73	61	56	410	31		4
441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
V48441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
2730	01	SHOP EQUIP AUTMV L S/E AUTO C			1		167	87	84	4460	101	2	18
W48391	04	WLD SHOP TLR MTD	NONE		1	R	179	96	97	7355	119	4	24
W5747	05	TOOL KIT VEN FTRAC		WELDER	1		64	37	37	1130	16	1	1
5811	02	TRAILER CARGO 1-1/	M105A2		19	R	166	83	55	2670	1818	25	208
99825	23	TRAILER TANK WATER	M149A2		8	R	162	81	81	2912	729	12	123
X40009	02	TRUCK CARGO 2 1/2	M35A2		22	R	265	96	81	13180	3887	145	656
0146	02	TRUCK CARGO 2-1/2	M35A2 WAM		5	R	279	96	81	13570	930	34	157
0794	15	TRK CGO D/S 5 TON	M923A1		5	R	311	97	94	22175	1047	55	205

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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TANK BATTALION (NAVY DIV)
 SRC - 17375L000
 Authorized Personnel Strength - 587
 2 Multiples of Unit in Force

NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
206157 01	ARMED MAINTENANCE V	NONE		4	NR	283	117	116	56000	920	112	222
0430 02	TRUCK CARGO 2 1/2	4X4 LMTV W		4	R	254	96	102	24013	677	48	144
07258 04	TANK COMBAT FULL T	M1A1E2		58	NR	360	144	114	123780	20880	3590	4959
294433 02	TRUCK WRECKER	MTV W/W W/		1	R	352	96	102	34826	235	17	50
22222X 99	Total Accompanying Supply	--							128758	805	64	161
2222Y 99	Total Ammunition	-----							7455	18	4	4
22222 99	Total Aggregate TOE *	---							188749	1276	94	255
										56623	5944	11641

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high
 and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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HMC INF DIV (MECH) BDE

SRC - 87042L200

Authorized Personnel Strength - 85

1 Multiples of Unit in Force

IN	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		11		43	40	40	48	131		11
8234	02	CARRIER PERSONNEL	M113A3		1	NR	208	100	81	23880	144	12	24
2887	02	CLEANER STM WNL MT	NONE		1	R	100	72	89	2780	50	1	9
D11538	02	CARRIER COND P FTR	M577A1		1	NR	192	100	104	22415	133	11	29
E55553	01	DISTR/ILLUM SET EL	1PH/60AMP		1		60	36	36	400	15		1
1966	01	GEN SET: DED SKD M	MEP 802A		2		50	32	36	825	22	1	2
5404	02	RADIO SET HIGH FRE		RADIO	2		27	20	40	130	8		1
J35813	01	GEN SET DED SKW	MEP 002A		1		51	32	36	940	11		1
4862	16	HEATER DUCT TYPE P	VB67-GFC3		1		56	33	55	450	13		1
8601	01	FIELD FEEDING KIT	COMPANY LV		1	R	254	91	93	5480	161	3	31
L28351	03	KITCHEN FIELD TLR	MFK75A		1	R	178	93	94	4200	115	2	23
14154	02	RANGE OUTFIT FIELD	M59		2		27	24	42	253	9		1
0544	02	RECOVERY VEH FTRAC	M578		1	NR	254	124	115	49320	219	25	52
333399	04	SANITATION CENTER		DRAIN TABLE	1		49	27	38	41	9		1
333399	08	SANITATION CENTER		WORK TABLE	1		56	26	38	57	10		1
1694	04	TRK UTIL CRG/TRP C	M998		14	R	181	84	53	5280	1478	37	163
2141	53	TANK&PUMP UNIT LIQ		TANK	2		72	61	52	475	61		7
V12141	54	TANK&PUMP UNIT LIQ		PUMP	1		79	32	50	800	18		2
8441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
8441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
V48441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
32593	02	SHOP EQUIP AUTHV L		MULTIPLE ITEMS	1		70	40	36	1002	19	1	1
5747	05	TOOL KIT VEH FTRAC		WELDER	1		64	37	37	1130	16	1	1
W5400	13	TRAILER CARGO 1/4	M416A1		2	R	108	61	43	620	92	1	8
W95811	02	TRAILER CARGO 1-1/	M105A2		1	R	166	83	55	2670	96	1	11
8825	23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
0146	02	TRUCK CARGO 2-1/2	M35A2 WAM		1	R	279	96	81	13570	186	7	31
X40831	20	TRK CGO 5 TON LMB	M924A1		1	R	311	97	94	22070	209	11	41
0833	02	TRUCK UTILITY 1/4	M151A2		2	R	132	64	53	2450	117	2	13
6068	01	TRAILER CARGO 2 1/	LMTV		1	R	209	96	58	2491	139	1	17
240430	02	TRUCK CARGO 2 1/2	4X4 LMTV W		3	R	254	96	102	24013	508	36	108
22222X	99	Total Accompanying Supply	--							18645	117	9	23
2222Y	99	Total Ammunition	-----							1080	3	1	1
222222	99	Total Aggregate TOE *	---							37311	272	19	54
											4560	186	689

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

ALTERNATIVE 2

(LIGHT)

INF BN (LIGHT)
SRC - 07015L000
Authorized Personnel Strength - 561
3 Multiples of Unit in Force

LN	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons	
7381	01	ANTENNA GROUP	OE-254(1)G		15		43	40	40	48	179		15	
668966	01	DRUM FABRIC FUEL	500 GAL CA		2		74	35	18	233	36		1	
742	02	REEL EQUIPMENT		STAND	25		6	24	36	32	25		2	
474	01	SHELTER SYS TLR MT M51			2	R	168	85	96	5360	198	5	40	
105096	01	TRK UTIL TOW CAR 1 M966			4	R	180	85	74	7195	425	14	66	
10844	01	TRK AMB 4 LITTER 4 M997			4	R	204	86	101	7500	487	15	103	
494	04	TRK UTIL CRG/TRP C M998			23	R	181	84	53	5280	2428	61	268	
161562	04	TRK UTIL CGO/TRP C M1038 W/W			4	R	179	84	53	5200	418	10	46	
22222X	99	Total Accompanying Supply	--							120862	756	60	151	
2222Y	99	Total Ammunition	-----							6998	17	3	3	
2222Z	99	Total Aggregate TOE *	---							60561	456	30	91	
												5426	201	786

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

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NLOS 20 (Light)

alt 2 from lgt

SRC - 07348T200

Authorized Personnel Strength - 57

1 Multiples of Unit in Force

	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		5		43	40	40	48	60		5
P56742	02	REEL EQUIPMENT		STAND	15		6	24	36	32	15		1
7679	01	TRK UTIL, HVY HMMV	M1097		12	R	191	86	72	5600	1369	34	205
759518	02	TRUCK CARGO 10T 8X	M977WMM		3	R	401	96	101	38800	802	58	169
T61494	04	TRK UTIL CRG/TRP C	M998		5	R	181	84	53	5280	528	13	58
3093	02	TRUCK WRECKER 8X8	M984 W/W		1	R	384	101	101	43180	269	22	57
7243	02	TRK TANK 2500 GAL	M978 WOWN		1	R	401	96	101	38165	267	19	56
T92242	01	TRK UTILITY 1-1/4	M1025		12	R	180	85	74	6104	1275	37	197
5537	02	TRAILER CARGO 3/4	M101A1		12	R	147	74	50	1350	907	8	94
8825	23	TRAILER TANK WATER	M149A2		1	R	162	81	81	2912	91	1	15
240430	02	TRUCK CARGO 2 1/2 4X4	LMTV W		1	R	254	96	102	24013	169	12	36
222222	99	Total Aggregate TOE *	---							13808	115	7	23
											5867	211	917

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

Date - 18-OCT-93

UNIT EQUIPMENT LIST

Page

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MHC INF DIV 80E (LID)

SRC - 77042L000

Authorized Personnel Strength - 131

1 Multiples of Unit in Force

M	NDX	Nomenclature	Model	Component Description	Auth Qty	Veh	Length (IN)	Width (IN)	Height (IN)	Weight (LBS)	Square Feet	Short Tons	Measure Tons
A79381	01	ANTENNA GROUP	OE-254(1)G		13		43	40	40	48	155		13
C32887	02	CLEANER STM WHL NT NONE			1	R	100	72	89	2780	50	1	9
S5553	01	DISTR/ILLUM SET EL 1PH/60AMP			4		60	36	36	400	60	1	5
11966	01	GEN SET: DED SKD M MEP 802A			4		50	32	36	825	44	2	3
M35404	02	RADIO SET HIGH FRE		RADIO	2		27	20	40	130	8		1
4862	16	HEATER DUCT TYPE P VB67-GFC3			1		56	33	55	450	13		1
28601	01	FIELD FEEDING KIT COMPANY LV			14	R	254	91	93	5480	2247	38	435
L28351	03	KITCHEN FIELD TLR MFK75A			7	R	178	93	94	4200	805	15	158
4154	02	RANGE OUTFIT FIELD M59			14		27	24	42	253	63	2	6
3399	04	SANITATION CENTER		DRAIN TABLE	7		49	27	38	41	64		5
33399	08	SANITATION CENTER		WORK TABLE	7		56	26	38	57	71		6
T07679	01	TRK UTIL,HVY HMMV M1097			6	R	191	86	72	5600	684	17	103
1494	04	TRK UTIL CRG/TRP C M998			22	R	181	84	53	5280	2323	58	256
9950	01	TANK UNIT LIQ DSPN TK LIQ DIS			1		73	61	56	410	31		4
V48441	02	TENT FRAME TYPE MA		FRAME SECTIONS	1		133	29	26	605	27		1
8441	03	TENT FRAME TYPE MA		FRAME SECTIONS	1		188	21	21	615	27		1
8441	04	TENT FRAME TYPE MA		FRAME SECTIONS	3		134	12	25	274	34		2
M32730	01	SHOP EQUIP AUTHV L S/E AUTO C			1		167	87	84	4460	101	2	18
M55537	02	TRAILER CARGO 3/4 M101A1			4	R	147	74	50	1350	302	3	31
5811	02	TRAILER CARGO 1-1/ M105A2			2	R	166	83	55	2670	191	3	22
M98825	23	TRAILER TANK WATER M149A2			7	R	162	81	81	2912	638	10	108
Z40439	02	TRUCK CARGO 5 TON MTV W/E			10	R	275	96	102	32207	1833	161	390
0712	01	TRLR CGO MTV W/DPS NONE			1	R	220	96	58	4733	147	2	18
Z222X	99	Total Accompanying Supply --								28735	180	14	36
Z222Z	99	Total Ammunition -----								1664	4	1	1
Z222Z	99	Total Aggregate TOE * ---								53533	424	27	85
											10526	359	1716

Aggregate TOE consists of all items less than 72 inches long by 72 inches wide by 35 inches high and is assumed to be stacked to a height of 96 inches

APPENDIX B

(U) RAIL CLEARANCE DIAGRAMS

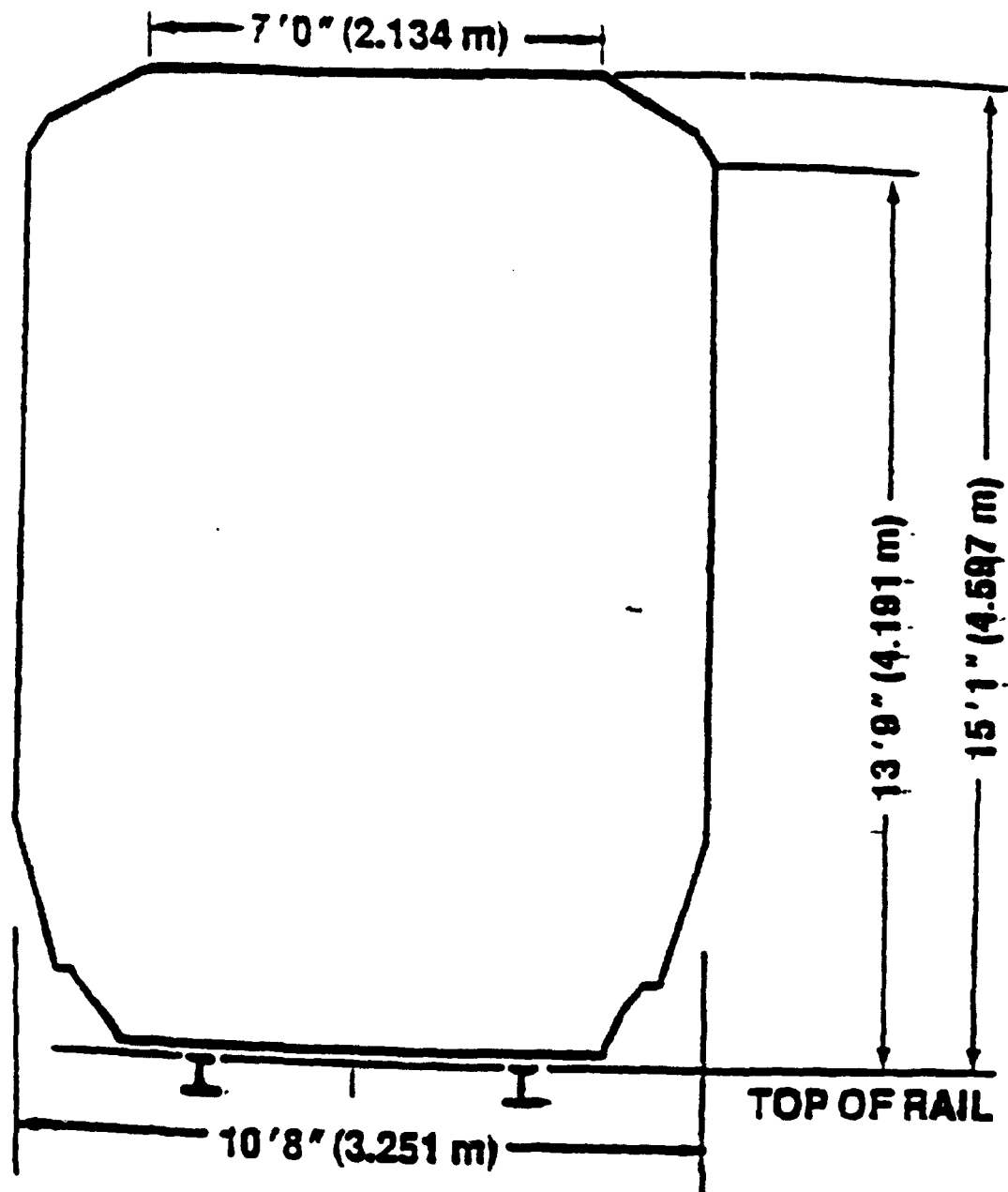


Figure B-1 (U)
Association of American Railroads (AAR)
Clearance Diagram

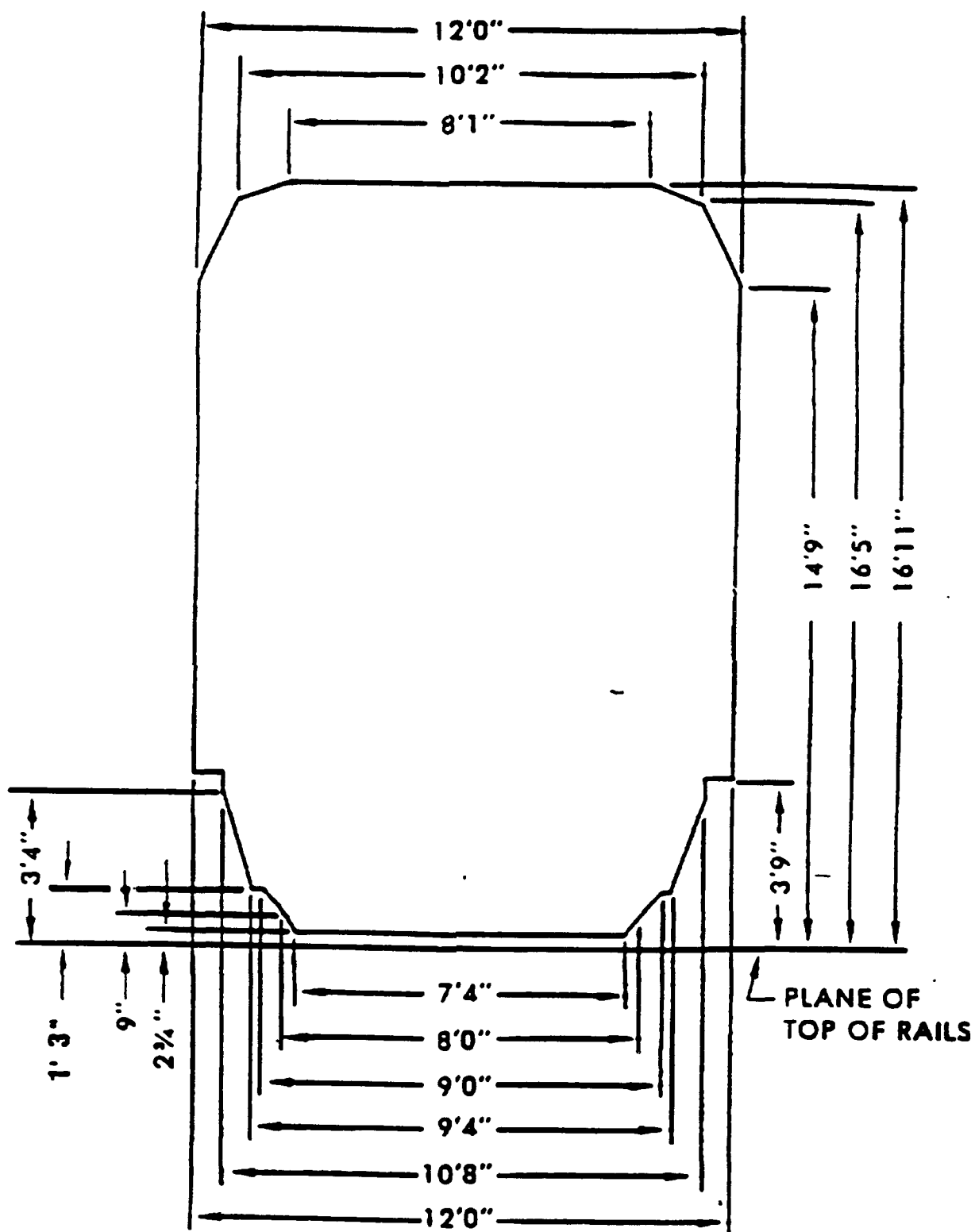


Figure B-2 (U)
Department of Defense (DOD)
Clearance Diagram

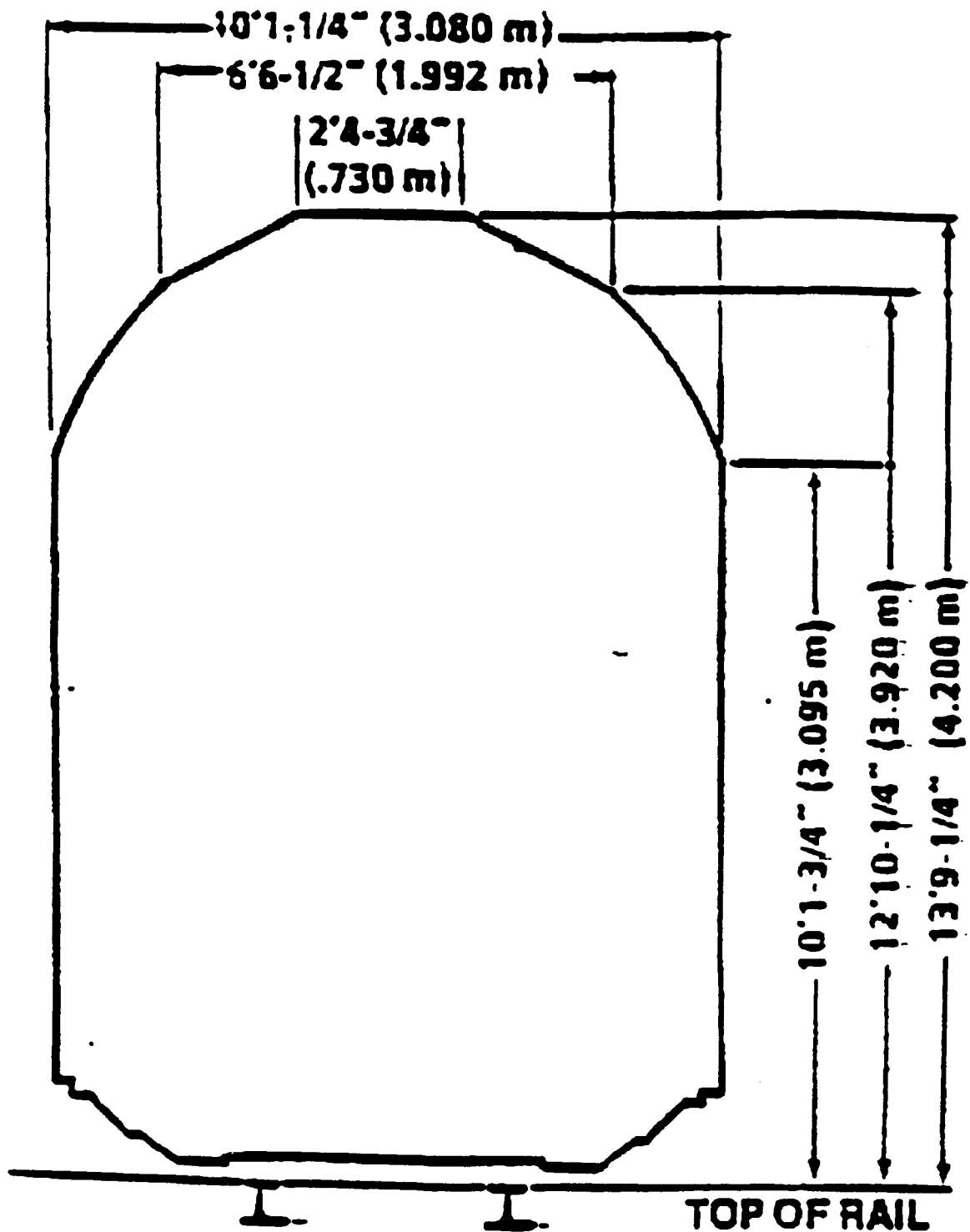


Figure B-3 (U)
Garbarit International De Chagement
Clearance Diagram

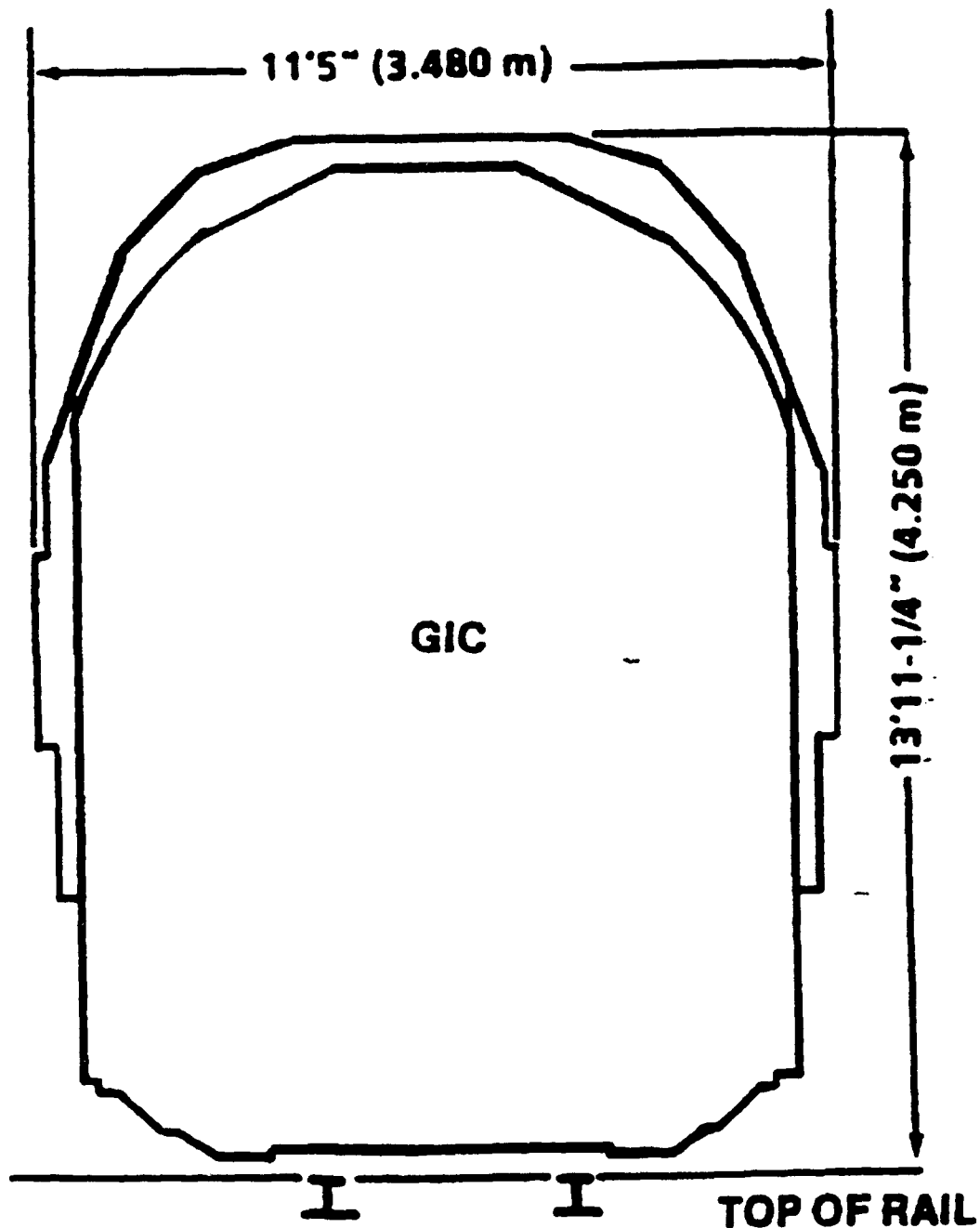
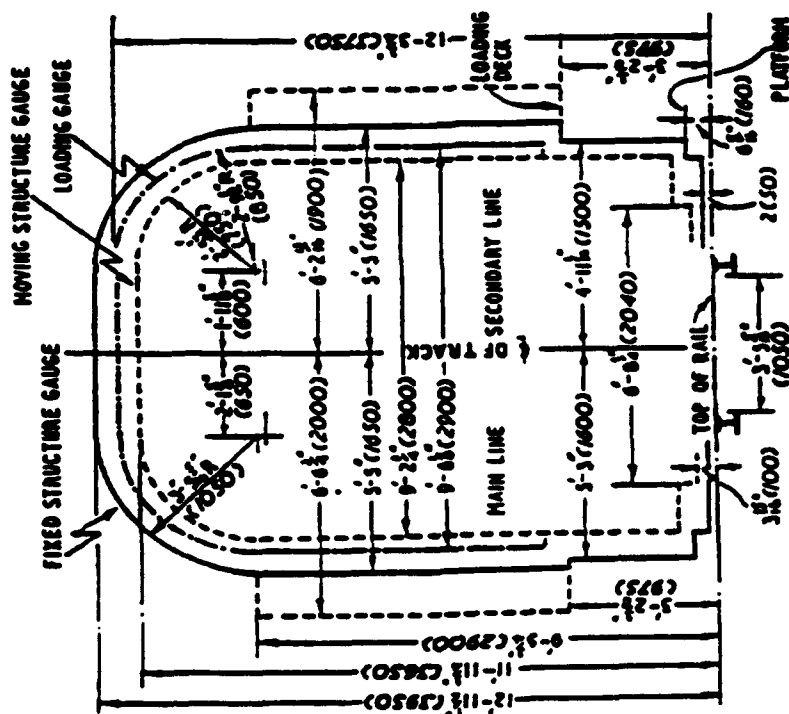


Figure B-4 (U)
Envelope B



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