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Monterey, California

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A CASE STUDY OF THE LIGHT ARMORED VEHICLE-25: INTEGRATED LOGISTICS SUPPORT OF A NON-DEVELOPMENTAL ITEM

by

Francis A. Quindlen, Jr.

December 1989

Thesis Advisor: Alan W. McMasters

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A Case Study of the Light Armored Vehicle-25: Integrated Logistics Support of a Non-Developmental Item

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ABSTRACT

In today's era of budgetary constraints, the military Services are being pressured to procure non-developmental or "off-the-shelf" equipment for use. This thesis is a case study of a non-developmental system, the Marine Corps' Light Armored Vehicle-25 (LAV-25). The decision to quickly acquire this non-developmental system was motivated by the urgent need for the Marine Corps to have a vehicle of this type to support their mission as a rapid deployment force. Combining a non-developmental system and an accelerated acquisition strategy produced a near-term focus that lacked sufficient consideration for long-term logistics support. This thesis identifies the inability to competitively reprocure spares and repair parts and the lack of a post production support plan as the two most serious problems in the fielding of the LAV-25. The lessons learned are that competitive spares reprocurement and post production support must be comprehensively planned for prior to award of a non-developmental production contract.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

AMCCOM	Army Armament, Munitions and Chemical Command
BOA	Basic Ordering Agreement
CCC	Canadian Commercial Corporation
DDGM	Detroit Diesel General Motors
DOD	Department of Defense
FSSG	Force Service Support Group
FY	Fiscal Year
HQMC	Headquarters Marine Corps
IOC	Initial Operating Capability
ILS	Integrated Logistics Support
LAI	Light Armored Infantry
LAV	Light Armored Vehicle
LAV-25	Light Armored Vehicle-25
LLTI	Long Lead Time Item
LORA	Level of Repair Analysis
LSA	Logistics Support Analysis
MCLBA	Marine Corps Logistics Base, Albany, Georgia
MENS	Mission Element Needs Statement
MPWS	Mobile Protected Weapons System
NSN	National Stock Number
PICA	Primary Inventory Control Activity
PIP	Product Improvement Program

PM	Program Manager
RAM	Reliability, Availability and Maintainability
RBL	Recommended Buy List
RDJTF	Rapid Deployment Joint Task Force
RFP	Request for Proposal
ROC	Required Operational Capability
TDP	Technical Data Package
TM	Technical Manual
TMDE	Test, Measurement, Diagnostic Equipment

I. INTRODUCTION

A. BACKGROUND

This thesis is a case study of the logistics support problems of the United States Marine Corps' Light Armored Vehicle-25 (LAV-25) program. The LAV-25 program has three distinct attributes which make it of interest. First, the LAV-25 program was characterized as non-developmental. It was planned as, essentially, an off-the-shelf acquisition. Second, the LAV-25 was an accelerated acquisition. Only 18 months elapsed between award of the LAV-25 production contract and the first fielding of the vehicle. Lastly, the LAV-25 is a large and complex weapon system. While off-the-shelf acquisition may be well-suited for simple commercial-use items, the use of off-the-shelf acquisition for large and complex weapons systems such as armored combat vehicles can produce serious logistics support problems.

B. OBJECTIVE

Numerous studies have been done documenting the logistics problems of developmental programs. Few studies have been done documenting the logistics difficulties that can arise in non-developmental programs. The LAV-25 program provides an opportunity to do the latter.

The objective of this thesis is not to reach specific solutions to LAV-25 logistics support problems. Rather, it

is to define and examine the significant logistics support issues associated with an important non-developmental program in order to recognize and understand the logistics planning problems that can be encountered in the accelerated acquisition of a complex non-developmental weapon system.

C. SCOPE

Although the LAV-25 experienced many logistical "growing pains" the author has chosen to focus on what he believes to be the two most significant difficulties encountered: supply support and post-production support.

D. APPROACH

Much of the information for this thesis was obtained from the organizations involved in the LAV-25 program. These organizations were: the Armored Combat Vehicle Branch of the Marine Corps Combat Development Command, Quantico, Virginia, the LAV Weapons System/Equipment Manager and the Contracts Directorate at the Marine Corps Logistics Base, Albany, Georgia, and the LAV Program Manager at the Tank-Automotive Command, Warren, Michigan. Other literature sources included the Naval Postgraduate School Library, the Defense Logistics Systems Information Exchange, the Defense Technical Information Center and various Department of Defense directives.

E. ORGANIZATION

This thesis is organized into four chapters. Chapter II provides a history and background of the LAV-25 accelerated acquisition, the logistics measures used to support the accelerated acquisition process, and the logistics problems and corrective initiatives employed in the program. Chapter III provides an examination of the classification of the LAV-25 as non-developmental. Chapter III also focuses on competitive reprocurement issues associated with off-the-shelf items as evidenced by the LAV-25. Chapter IV provides conclusions and recommendations describing the key lessons learned from the LAV-25 program.

II. BACKGROUND AND HISTORY

A. INTRODUCTION

This Chapter has four purposes. The first purpose is to explain the need for, and the history behind, the accelerated acquisition of the LAV-25 by the United States Marine Corps. Emphasis is placed on identifying why an accelerated acquisition strategy was adopted and on contrasting the LAV-25 acquisition process with a normal acquisition cycle. The second purpose is to identify the significant and unique Integrated Logistics Support (ILS) measures required to support the accelerated fielding of the LAV-25. The third purpose is to identify the significant, unanticipated support issues arising from the accelerated LAV-25 fielding. The final purpose of this chapter is to evaluate the corrective measures taken to alleviate LAV-25 ILS difficulties.

B. DESCRIPTION OF THE SYSTEM

The LAV-25 is the principal vehicle and weapon system of the LAV family of armored combat vehicles. The LAV-25 was the first vehicle of the family fielded by the Marine Corps. Other LAV variants fielded subsequent to the introduction of the LAV-25 include the Logistics (LAV-L), Anti-Tank (LAV-AT), Mortar (LAV-M), Recovery (LAV-R), and Command and Control (LAV-C2) variants. The Air Defense (LAV-AD) and

Assault Gun (LAV-AG) variants are currently undergoing development. All vehicles in the LAV family share the following common characteristics and capabilities:

- Rapid transportability by both air and surface means. LAVs are transportable by C-130, C-141 and C-5 aircraft and by CH-53E helicopter. LAVs are compatible with U.S. Navy amphibious ships and landing craft.

- Eight-wheeled vehicle capable of four-wheel or eight-wheel drive.

- Same basic steering assemblies, suspension, power train and engine.

- Similarly configured ballistic armored hull protection.

- All LAVs have a swimming capability. LAVs are capable of crossing bodies of water with low sea states, such as lakes and rivers. LAVs cannot negotiate open ocean and surf, such as would be required in an amphibious assault.

However, it is the particular mission, and associated weapons configuration assigned to carry out that mission, that makes each LAV variant unique. The LAV-25 primary weapon system is the M242 Bushmaster 25 millimeter chain gun cannon. The secondary weapon system is a pintle-mounted M240E1 7.62 millimeter machine gun. The LAV-25 also carries two M257 smoke grenade launchers to provide battlefield masking. The LAV-25 carries a crew of seven (Vehicle Commander, Assistant Vehicle Commander/Gunner, Driver and four scout infantrymen).

LAV-25s are found within the Light Armored Infantry (LAI) Battalion[1] of each Marine Division. Doctrinally, the primary mission of the LAI Battalion is [Ref. 1]:

> To conduct reconnaissance, security and economy of force operations in support of the Marine Division or its subordinate elements and, within its capabilities, conduct limited offensive or delaying operations that exploit its mobility and firepower.

Essentially, the LAV-25 performs an armored reconnaissance mission. To accomplish this mission, the LAV-25 must be capable of engaging and defeating similar armored combat vehicles while providing armored protection for the vehicle crew. The LAV-25's principal advantages are its speed, mobility and rapid fire support. Its principal disadvantage is its light armor protection which makes it susceptible to larger-than-small arms direct fire weapons and anti-armor weapons.

C. ACQUISITION HISTORY

In the early 1970's, the Marine Corps recognized its warfighting ability was significantly diminished by [Ref. 2: p. 3343]:

- Reduced availability of Naval Gunfire support.
- Increased enemy air capability.

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[1]Previously named the Light Armored Vehicle Battalion.

- Loss of the 3.5 inch rocket launcher, the 106 millimeter recoilless rifle, and the Ontos[2] from the weapons inventory.

Numerous Marine Corps studies identified the solution to this reduced capability as a mobile armored weapon system providing maneuverability and direct fire support for ground forces. This armored weapon system came to be known as the Mobile Protected Weapon System (MPWS).

In 1979, the Rapid Deployment Joint Task Force (RDJTF) was formed to improve the nation's military capability to respond quickly to world crises. The U.S. Army, along with the Marine Corps, identified the need to enhance RDJTF forces with an armored weapons system capable of rapid response. The Congress agreed that the Army and the Marine Corps lacked sufficient armored mobility and firepower for RDJTF purposes and considered this shortcoming to be a very serious deficiency. In testimony before the Senate Armed Services Subcommittee on Research and Development regarding Rapid Deployment Force Programs, Senator Gary Hart stated [Ref. 2:p. 3177]:

> An effective Rapid Deployment Force should have two characteristics. First, it should be capable of rapid strategic mobility, so as to respond in a timely manner to a crisis. Second, it should have an adequate tactical mobility so as to fight effectively once it arrives on the scene of a crisis. Currently, we have few, if any, forces which combine these two characteristics.

---

[2]The Ontos was a tracked, armored, assault and anti-tank vehicle with six 106 millimeter recoilless rifles mounted on its chassis.

Senator Hart concluded his testimony with the following recommendation [Ref. 2:p. 3180],

> Mr. Chairman, I strongly recommend a program to move immediately to acquire a family of light armored vehicles. Further, I suggest it be a Marine Corps, rather than Army or joint program....The immediate need is a Marine Corps need and it should be filled by a Marine Corps program.

The RDJTF mission, combined with the Iranian hostage situation, the diminished Marine Corps assault capability and the growing public awareness of the need to modernize the armed forces, created, in the early 1980's, a political climate very favorable for the acquisition of such a system. However, the MPWS, as a new design, would require six to ten years before reaching full-scale production and operational deployment [Ref. 2:p. 3344]. Because of this perceived urgent need, emphasis was placed on quickly acquiring a light armored weapons system that would, as much as possible, meet MPWS requirements while meeting RDJTF purposes. The MPWS, as a separate long-term acquisition, was expected to be available in the late 1980's.

The Department of Defense (DOD) was directed by the Senate Armed Services Committee to procure an armored vehicle of the same design for the Army and the Marine Corps with production to begin in Fiscal Year (FY) 1982 [Ref. 3:p. 183]. To meet this requirement, an off-the-shelf acquisition strategy was adopted.

In December 1980, the Marine Corps established its Required Operational Capability (ROC) for a Light Armored

Vehicle. This ROC specified a goal of 1983 for achieving Initial Operational Capability (IOC). IOC is defined as [Ref. 4]:

> The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned and operated by an adequately trained, equipped and supported military unit or force.

On May 8, 1981, the Secretary of Defense approved the Mission Elements Needs Statement (MENS) for the Light Armored Vehicle program. This key document provides the core of the Light Armored Vehicle acquisition strategy. It contains the Secretary's direction to the Army and Marine Corps and defines the accelerated nature of the program by stating, "Every effort will be made by both Services to expedite delivery of this urgently required system." A copy of the MENS is included as Appendix A. Key requirements of the MENS include:

- Tailoring the acquisition process to meet a planned IOC of 1983.
- Designating the LAV as a non-major system.
- Requiring a joint Army and Marine Corps acquisition to acquire one system which satisfies the needs of both Services.
- Designating the Army as the contracting agency with acquisition responsibility for the program.
- Requiring the Program Manager (PM) to be a Marine Officer.
- Requiring a Product Improvement Program (PIP).

As a result of the Secretary's guidance, the Army and the Marine Corps agreed to the establishment of a joint program

office at the Tank-Automotive Command (TACOM), Warren, Michigan.

With the Secretary's approval of the Marine Corps' 1983 IOC goal, the Army and Marine Corps faced the requirement to proceed from Milestone 0 to Milestone 3 and IOC in approximately two years. This necessitated combining the Concept Exploration, Concept Demonstration and Validation, and Full-Scale Development Phases of the acquisition process into one very short 24-month phase. This fundamental consideration drove all acquisition plans. Essentially, the accelerated LAV acquisition effort required reducing the normal six-to-ten years needed to reach full-scale production to two years. To accomplish this, the following acquisition strategy was developed:

- Conduct a market survey to identify manufacturers with the ability to produce an off-the-shelf item capable of fulfilling the operational requirements of the ROC.
- Select four candidate vehicles for testing.
- Select the best of the four candidates to receive the production contract.
- Procure the required number of LAV's through a five-year contract.

The acquisition strategy contained two phases. Phase I comprised the market survey and testing of off-the-shelf LAV candidates capable of being modified to meet Marine Corps requirements. Phase II comprised the production and deployment phase.

In April 1981, the Phase I Request for Proposal (RFP) was released. Included in the Phase I RFP was the definitive requirement for the LAV to be an off-the-shelf acquisition. Off-the-shelf was defined as follows [Ref. 5]:

> The offeror must have previously produced the vehicle, the vehicle is commercially available, and the vehicle is substantially composed of components which are in commercial or military in-service use. Notwithstanding this "off-the-shelf" requirement, an offeror must also be able to meet the following requirements: Deliver test vehicles as specified 60 days after the contract award; meet the technical and performance requirements specified in this RFP; and possess the capability and capacity to produce and deliver, in the configuration required, the first year vehicle production requirements.

Phase I contracts were awarded in September 1981 to three firms for four test vehicles. These were:

TABLE 1

LAV PRODUCTION CONTRACT COMPETITORS

FIRM	VEHICLE
Alvis Ltd. of England	Scorpion
Cadillac Gage	Commando V150 4x4
Cadillac Gage	Commando V300 6x6
Canadian Commercial Corporation (for Detroit Diesel General Motors of Canada)	LAV-25 8x8

Candidates were to be evaluated based on Technical, Performance, Cost and Production abilities. Competitive testing of the LAV candidates took place between 1 November 1981 and 31 May 1982. On 27 September 1982, Detroit Diesel General Motors (DDGM) of Canada, through Canadian Commercial

Corporation (CCC), was awarded a Firm Fixed Price with Economic Adjustment contract to produce the LAV-25 for the Army and the Marine Corps.

Subsequent to award of the LAV-25 production contract, the Army reviewed and reconsidered its requirement for the LAV. Revised operational requirements for the Army's Light Infantry Division, combined with budgetary constraints, caused the Army to terminate its portion of the LAV program on 29 December 1983. Some LAVs contracted for Army procurement were transferred to the Marine Corps. The initial Marine Corps LAV-25 acquisition profile (number of production starts per year), and final profile after Army program termination, is listed below:

TABLE 2

LAV-25 FY ACQUISITION PROFILE

	82	83	84	85	Total
Initial	60	134	60	35	289
Final	60	170	123	69	422

The first production vehicle was delivered on 28 November 1983. This vehicle and the next 14 produced were used for various operational and engineering tests. The first delivery of LAV-25s to a Marine Corps unit occurred when three LAV-25s were delivered to Infantry Training School (ITS), Camp Pendleton, California. These three

vehicles were used for training of vehicle crewmen. The first delivery of LAV-25s to a combat unit occurred in May 1984 when LAV-25s were delivered to Company A, 1st LAV Battalion, 29 Palms, California. The last LAV-25 was completed in 1986 and delivered to the Marine Corps in May 1987. The LAV-25 is expected to have a 20-year life cycle. The estimated total cost for the LAV program was $900 million.

D. PROGRAM MANAGEMENT

On 5 June 1981, the Army and the Marine Corps entered into a Memorandum of Agreement specifying the conditions for establishing the joint LAV Program Manager's (PM) office. As stated above, the PM was located at the Army's TACOM, Warren, Michigan. With the establishment of the PM, the focus of the acquisition effort shifted from the Marine Corps Development and Education Command, Quantico, Virginia, to TACOM. The first LAV PM Charter was approved by both Services in 1982. The Charter designated the PM as the single individual responsible for [Ref. 6:p. 1]:

- Overall acquisition and execution of the program.
- LAV life cycle management.
- Selecting and structuring an Integrated Logistics Support (ILS) system to provide full ILS prior to fielding.

Essentially, the PM represented the interests of the Government to the contractor.

With the establishment of the PM, a single individual (but joint organization) was now responsible for all aspects of joint LAV development. The LAV PM office remained a joint office until early 1984 when the Army terminated their involvement in the LAV program. Although the PM office remained at TACOM, the Marine Corps became the sole user responsible for the LAV program.

E. INTEGRATED LOGISTICS SUPPORT MEASURES

ILS is a composite of all considerations necessary to assure the effective and economical support of a system for its life cycle. ILS can be defined as [Ref. 7:p. 351]:

> A disciplined, unified, and iterative approach to the management and technical activities necessary to: (a) integrate support considerations into system and equipment design; (b) develop support requirements that are related consistently to readiness objectives, to design, and to each other; (c) acquire the required support; and (d) provide the required support during the operational phase at minimum cost.

To manage ILS considerations, three levels of ILS planning and coordination existed in each of the support organizations. At the first level were the branch heads who established logistics policies and resolved problems that could not be resolved at lower levels. At the second level were logistics managers who carried out the policies and direction provided by higher headquarters. At the third level were the various functional, technical and administrative support personnel. Planning and coordination

between all three levels of all four branches occurred continuously.

Because the Marine Corps was now the only Service requiring the LAV-25, all LAV-25 logistics data developed was converted to a Marine Corps format, in accordance with MIL-STD-1388-1A and Marine Corps Order 4400.32, Policy For Logistics Support of New Equipment Introduced into the Marine Corps. Additionally, selected logistics functions were transferred from Army organizations to Marine Corps and other organizations. A transition plan was developed in early 1985 to begin transferring ILS functions from TACOM and the Army Armament, Munitions and Chemical Command (AMCCOM) to Headquarters, U. S. Marine Corps (HQMC), Marine Corps Logistics Base, Albany Georgia (MCLBA), and the Defense Logistics Agency (DLA). Significant transfers included [Ref. 8]:

- Transfer of the Primary Inventory Control Activity (PICA), responsibility for LAV-25 Marine Corps unique items, from AMCCOM to MCLBA.

- Transfer of PICA responsibility for items used on the LAV-25, but common to other Department of Defense (DOD) systems, to DLA.

- Transfer of Logistics Support Analysis (LSA) data files and management responsibility from TACOM and AMCCOM to MCLBA.

- Transfer of maintenance management responsibility from TACOM and AMCCOM to MCLBA.

- Transfer of responsibility for technical content of LAV Technical Manuals (TMs) to HQMC.

Thus, although the PM was primarily responsible for Program support, three other organizations had important support responsibilities. These organizations were DLA, HQMC, and MCLBA. DLA was responsible for providing supply support for items for which DLA was designated as Integrated Material Manager. HQMC established the Acquisition Project Office in the Ground Weapons Branch to coordinate Marine Corps acquisition activities and policy. MCLBA was responsible for LAV-25 logistics support once the LAV-25 was placed in service in Fleet Marine Force units.

The LAV-25 accelerated acquisition strategy naturally required accelerated ILS planning. With a mere 18 months between contract award and planned attainment of IOC, ILS planners faced the monumental task of ensuring adequate near-term and long-term support was provided for the LAV. The potential for supportability problems was acknowledged early in the program. The PM's Acquisition Plan states [Ref. 9:p. 9]:

> The combination of an accelerated LAV acquisition schedule and compressed time frame for ILS planning increases the risk in meeting important support functions which could impact on operational requirements and on life cycle costs. To minimize this risk, very specific and detailed ILS planning has been integrated into the program early to ensure that supportability is thoroughly and continuously examined for both Services.

Thus the focus of the ILS approach was to minimize near term support risks.

To appreciate the magnitude of the LAV-25 ILS challenge, it is necessary to briefly revisit the vehicle's history.

The LAV-25 is manufactured in North America by DDGM under a licensing agreement from the Swiss firm MOWAG. The original or base vehicle is a Swiss design by MOWAG called Piranha. The LAV-25 was, in effect, re-created from the original Swiss design so as to be acceptable for American or Canadian armed forces. This process of "North Americanization" created a new vehicle. This new vehicle, the LAV-25, was not actually in production or in use by other armed forces. Thus there was no developed or "experienced" ILS package available to the Marine Corps. ILS required a developmental, "start from scratch" effort.

Despite the lack of a tested ILS package, the LAV program had several characteristics which would help offset the accelerated nature of the program and stabilize planning. The LAV-25 represented current, not leading technology. Design of the chassis, engine and hull were stable. Design changes were anticipated in the turret. These design changes, while anticipated, were not expected to be disruptive to the ILS process. Additionally, the LAV-25 had a great deal of commonality with other existing systems in the Department of Defense (DOD) inventory. Nevertheless, adhering to standard ILS procedures, as used in a normal acquisition process would not allow for support to be in place by the planned IOC date. This extraordinary situation called for creative ILS measures. The

distinguishing characteristic of these innovative measures was reliance on the contractor for support.

1. Supply Support

The most significant of these measures involved supply support. The goal of the supply support process was to ensure that adequate support equipment, repairables, repair parts, and supply publications required to support and maintain the LAV were available at the appropriate levels of maintenance and supply during the initial period of operational use, and that this support was continued and improved through the review/replenishment supply support procedures [Ref. 10:p. II-24]. The near-term plan was to develop three supply mechanisms to obtain spares concurrent with production and initial fielding of the LAV-25. These three initial fielding support mechanisms were the Recommended Buy List (RBL), the Basic Ordering Agreement (BOA) and the 60-Day Mount Out List.

a. Recommended Buy List (RBL)

The RBL was a list of contractor recommended repair parts and spares with quantities, at guaranteed prices, to support the initial fielding of LAV-25s for a twelve-month period [Ref. 10:p. II-25]. The primary purpose of the RBL was to serve as a mechanism to obtain Long Lead Time Items (LLTI). LLTI were defined as parts requiring seven months or more production lead time. A significant characteristic of the RBL was that it was compiled solely by

the Contractor without Government participation. The Government had to accept the types and quantities of spares listed in the RBL. Any change would constitute a renegotiation and could delay delivery. The RBL was an interim support device to be used while more detailed long term provisioning was being accomplished. Any requirement for parts not on the RBL could be filled by exercising the BOA.

b. Basic Ordering Agreement (BOA)

The BOA was an agreement between the Government and Detroit Diesel General Motors, through Canadian Commercial Corporation, requiring DDGM to provide "spare and repair parts, including any and all major assemblies, subassemblies, special tools and special Test, Measurement and Diagnostic Equipment (TMDE) for the variants of the Light Armored Vehicle family...." [Ref. 10:p. II-26] Conceptually, the BOA was designed to succeed the RBL as a spares obtaining mechanism once the RBL expired. The initial BOA was effective beginning on 3 February 1983. The initial BOA was renewed yearly until it expired in 1987. After expiration of the initial BOA, a new BOA was written in 1987 and is currently being used. A distinguishing feature of this BOA was that it indirectly served as a mechanism for ensuring the availability of post production support. As a requirement of the BOA, CCC agreed to provide a pre-priced parts list for all LAV-25 parts on a quarterly

basis. Additionally, CCC agreed to attempt to develop second sources for LAV-25 parts.

Unlike the RBL, BOA prices were negotiated at the time of purchase. The BOA served, essentially, as a contracting expedient. It was an agreement against which orders could be placed. But the BOA was a sole source procurement mechanism. As such, sole source justification was required.

c. 60-Day Mount Out List

This list provided prices and quantities sufficient to support 35 LAVs for 60 days in combat. The range and depth of the list was determined by DDGM.

The long-term plan for follow-on provisioning and repair parts support was to rely on the Government supply system to provide sustained supply support. Spares and repair parts would be provided by either DLA or MCLBA, depending on which organization had the Integrated Material Management responsibilities for the required parts.

2. Logistics Support Analysis (LSA)

LSA is an inherent part of the systems engineering process. LSA constitutes the integration and application of various functions and techniques to ensure that supportability requirements are considered in the systems design process. LSA can effectively aid in evaluating a design configuration relative to the determination of specific logistics support requirements. LSA can also be

useful in evaluating the operating system in terms of its supportability in the field environment. [Ref. 7:pp. 140-141].

As a requirement of Phase I competition, all four competitors delivered a preliminary LAV-25 LSA. Consequently, the suitability of the full LSA was not a prime consideration in making the production contract award. After award of the production contract, DDGM conducted a follow-on full-scale LSA in accordance with MIL-STD-1388-1A and 2A.[3] The timing of the LSA was of critical importance. Lacking the time to develop and validate the LSA prior to production, the full LAV-25 LSA was conducted concurrent with production of the vehicle. Thus, one of the major benefits of conducting the LSA prior to entering into production was not realized in the LAV-25 program. The Government could not use the LSA to ensure that supportability requirements were considered in the LAV-25 design process. The Government had to rely on the contractor to ensure that was done. Although DDGM's LSA capability was rated as "good" in the source selection process, supportability as a result of design was not a primary consideration.

The initial LSA review was conducted in May 1983 and quarterly reviews were held thereafter. Lacking any field

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[3]No LSA was conducted on the LAV-25 engine or the M242 chain gun because these systems already existed within DOD.

usage data for the LAV-25, data were collected from alternate sources. The data obtained from Phase I testing, along with some data provided by the Canadian Armed Forces, were used. Additionally, the LSA was conducted using M60A1 tank field usage data to supplement DDGM's existing LAV-25 data. The M60A1 tank data were used as a model in evaluating personnel requirements and maintenance concepts which were later verified through the full LSA process. This combined LSA data base served as the basis for determining the quantities and types of spares required to support the LAV-25. A Level of Repair Analysis (LORA) was conducted, in accordance with MIL-STD-1390, concurrent with the development of the LSA data base and was used to evaluate maintenance considerations derived from the LSA data.

3. Maintenance Concept

The LAV maintenance concept reflects the standard Marine Corps maintenance organization, as required by Marine Corps Order P4790.1, Marine Corps Integrated Maintenance Management System. Required maintenance functions and tasks were assigned to levels of maintenance, and echelons of maintenance within maintenance levels, as a result of the LSA and LORA. The LAI Battalion is capable of all organizational level maintenance and limited intermediate level maintenance on the LAV-25. Maintenance requirements beyond the Battalion's capability are evacuated to the Force

Service Support Group (FSSG) where more complete intermediate maintenance capabilities exist. Depot level maintenance is conducted at the Marine Corps depot repair facilities at MCLB Albany, Georgia and MCLB Barstow, California.

4. Technical Publications

As an interim measure, LAV-25 commercial manuals supplied by the contractor were fielded in lieu of validated and Marine Corps approved Technical Manuals (TMs). LSA data were not available to develop the publications. However, TMs would not have been available to support fielding of the vehicle if the contractor waited for completion of the LSA. Thus, as a concession to the fast track nature of the program, TMs were developed concurrent with LSA development. LAV-25 TMs were expected to be ready during October-December 1984. That proved to be an overly optimistic goal. Most LAV-25 TMs were not ready at that time. Even when published, the TMs contained numerous inaccuracies. The estimated and actual availability dates for LAV-25 TMs are listed in Appendix B.

5. Reliability, Availability, Maintainability (RAM)

The LAV-25 reliability goal was 1950 Mean Miles Between Mission Failures (MMBMF). The minimum MMBMF was 1250 miles. A 90% Operational Availability was desired based on an assumed Administrative and Logistics Delay Time of 17 hours per mission failure. The LAV-25 Maintenance

Ratio (MR), defined as maintenance hour per operating hour excluding crew checks and services, was 0.3 at the organizational level and 0.08 at the intermediate level. No more than 20% of the maintenance tasks were to be performed at the intermediate level or higher [Ref. 9:p. 12]. The Mean Time To Repair (MTTR) goal was not to exceed 1.3 clock hours.

No conclusive data yet exists on LAV-25 RAM. Studies are in progress to evaluate the LAV-25 RAM performance. During Initial Production Testing and Evaluation, some LAV-25s underwent RAM testing and greatly exceeded RAM requirements. The FMF general perception is that the LAV-25 has performed well beyond RAM expectations.

6. Buyback Plan

The Buyback Plan provided a measure of protection for the Government against obsolescence occurring as a result of configuration changes initiated by the contractor. Under the provisions of the Buyback Plan, the Government would be compensated for all spares, repair parts and special tools rendered obsolete as a result of contractor design changes. Buyback Plan provisions included the following items.

- The Government would be reimbursed for obsolete items for which no replacement was necessary.
- For items procured from the RBL which require replacement, replacement items would be provided by the contractor and obsolete field stock would be returned to the contractor.

- For items not procured from the RBL, the Government would procure required replacements by issuing a contract for the required items. The original contractor would then reimburse the Government for the contract price of the replaced parts.

The Buyback Plan only applied if the design change was initiated by the contractor. Given the expected design changes of the LAV-25 turret, the Buyback Plan was prudent protection for the Government. But Government initiated design changes were not covered under the Buyback Plan. Thus the Government must absorb the costs associated with Government initiated design changes. Under the Product Improvement Program, 21 Government-initiated planned improvements for the LAV-25 were approved. Additionally, numerous other design changes or modifications to the other LAV variants are pending. The cost to the Government to retrofit the LAV-25 fleet with these changes is undetermined because of a lack of funding. But costs could run into the tens of millions of dollars for Government initiated design improvements.

F. INTEGRATED LOGISTICS SUPPORT ISSUES

Given the accelerated nature of the LAV program, ILS planners foresaw many problems and recognized that not all of these expected problems could be fully resolved prior to fielding the LAV-25. For many issues, the only possible course of action was to allow sufficient time for development of solutions. Examples of these acknowledged and expected problems include: availability of accurate

technical publications, lack of the proper types and quantities of tools, lack of the proper types and quantities of Test Measurement and Diagnostic Equipment (TMDE), uncertainty as to proper doctrine regarding LAV employment, lack of adequate facilities for LAV units at the various Marine Corps bases, adequacy of equipment allowances, availability of required training and wartime ammunition, and serious manpower assignment issues. What is noteworthy is that these and some other problems were expected.

Important unexpected ILS issues regarding supply support and post production support also arose after the vehicle was fielded. The most significant unanticipated supportability issue involved repair parts availability. From a statistical perspective, the availability of LAV-25 repair parts seemed satisfactory after the LAV-25 was fielded. DLA generally reported approximately 90% availability for DLA managed LAV National Stock Numbers [Ref. 11]. And indeed, the three supply mechanisms put into place to provide near term support worked well for the automotive portion of the LAV-25. However, almost immediately after introduction to FMF units, the LAV-25 began experiencing excessively high failure rates due to the non-availability of certain long lead time turret electronic components. These components were unique to the LAV-25. As such, these turret parts were new to the supply system and, unlike the LAV automotive parts which were already resident in the supply system

because they were common to other systems, required establishing a provisioning base without any field usage data to support provisioning estimates.

The difficulty in providing an adequate level of turret electronic component spares and repair parts was compounded by other factors. The turret electronic component failure rate exceeded the failure rate predicted by the LSA. The proper test equipment to troubleshoot, isolate and identify failed turret components was not available to supporting maintenance activities. The LAV-25 had been fielded before the proper turret test equipment could be procured and fielded to supporting maintenance activities. Thus, for most failed turret components, corrective maintenance could not be accomplished at the appropriate level. In many cases, failed components that should have been repaired at the organizational level were evacuated from the user to the Depot Maintenance Activity at MCLBA for repair. This turret failure problem was common to all LAV units and threatened to bring the LAV program to a halt.

The Post Production Support Plan (PPSP) is a procedure for identifying post production logistics support requirements and ensuring these requirements are planned for and met. As per MIL-STD-1388-1A, the purpose of the Post Production Support Analysis is to:

> ...analyze life cycle support requirements of the new system/equipment prior to closing of production lines to assure that adequate logistics support resources will be available during the system/equipment's remaining life.

Contractually, there was no requirement for a PPSP in the original LAV-25 production contract. This oversight was addressed by contract modification P00131 in 1987. This modification identified the extent of required contractor post production support as a data list of LAV-25 turret and chassis parts sorted by DDGM part number, National Stock Number (NSN), lead time and unit price. This list also identified an estimated price to procure out-of-production items. Additionally, the contractor was required to provide the estimated dates when contractors and subcontractors would be ending LAV-25 production support. Although this list satisfied DDGM's post production contractual obligation, from the Government's point of view the list was of little value. Any post production support requirements beyond the information provided on the list would have to be developed by the Government without contractor support.

G. CORRECTIVE INITIATIVES

Shortly after receiving its LAV-25s in May 1984, Company A, First LAV Battalion began experiencing difficulty obtaining repair parts. This was the beginning of a repair parts problem that would last the next four years. While Company A's initial problems involved the automotive portion of the vehicle, the more lasting and serious problems were encountered, as stated above, with the turret electronic components. As LAV units were activated and began using the vehicle, turret component failures occurred. Lacking the

proper TMDE and tools to isolate faults and conduct repairs at the organizational and intermediate maintenance levels and sufficient spares within the supply system, LAV units experienced a decrease in LAV-25 combat readiness. This problem was first recognized as an FMF-wide problem in August 1985.

Once the scope and seriousness of the turret parts problem was realized, ILS planners organized to address the problem. One of the first steps taken was to organize an LAV "Tiger Team." The Tiger Team consisted of ILS representatives from HQMC, MCLBA, PM-LAV and DLA. The Tiger Team's function was to concentrate, as a team, all their efforts on resolving ILS problems. Possible solutions, again, focused on near-term and long-term initiatives.

1. Near-Term Initiatives

For near-term assistance, ILS planners turned to the three support mechanisms created to support initial fielding. The following options were considered:

- Utilize the BOA as a mechanism to contract for emergency replenishment of turret components.
- Borrow needed turret parts from the LAV-25 production line.
- Allow the MCLBA Depot Maintenance Activity to make repairs on failed components and accept the resulting long repair times and lowered LAV-25 readiness.
- Utilize LAV-25s in Prepositioned War Reserve Stocks for turret spares.
- Prohibit operational use of the LAV-25 fleet until turret spares availability improved.

As in the supply support provisioning effort, the near term solutions relied heavily on contractor support. Option 1 was adopted as the cornerstone of the get-well effort. Options 2 and 3 were used in an attempt to provide immediate support to FMF units. Options 4 and 5 were considered but not implemented.

The process of awarding the contract for the emergency replenishment purchase took just over one year to complete. In August 1985, promptly after identifying the turret parts problem, a sole source procurement action against the BOA for LAV emergency spares was initiated. It took approximately ten months to prepare this contract. But on 5 June 1986, HQMC rejected the sole source procurement under the Business Clearance Procedure and the requirements of the Competition in Contracting Act which require the approval of the Competition Advocate of the Marine Corps for all procurements greater than $1 million that are other than competitive actions. A competitive RFP was then released 23 June 1986 to nine potential sources. However, no bids were received from industry in response to the competitive RFP. The only response received of any kind was from Delco Systems Operations requesting a 120-day RFP extension. With no response to the RFP from industry, MCLBA contacted CCC and, in effect, asked them to submit a proposal. CCC agreed to respond. But their response contained higher prices and longer lead times than anticipated. On 3 September 1986, as

part of the near-term solution, and with really no other options available, MCLBA used the BOA to contract for two emergency spare parts procurement contracts for LAV-25 parts to CCC and Delco Systems Operations[4]. The net result of the concerted effort to ensure adequate competition was actually no competition at all and the additional delay of one year in obtaining the parts.

The emergency spares procurement contract with CCC called for delivery of 24 line items within 30 days of contract award. Since the Marine Corps did not realistically expect full delivery within 30 days, the delivery timeframe was not considered to be a strict contract deliverable. The contract contained no provision for penalties if the contractor failed to deliver within the specified timeframe. Given the lack of industry interest in the contract, the Marine Corps was hardly in a position to insist or demand strict compliance with the delivery timetable. Instead, the 30-day delivery provision served two purposes. First, it underscored the emergency nature of the procurement. Second, it served as a goal for the Marine Corps to begin to expect relief. But the 30-day delivery provision proved to be overly optimistic. By 29 July 1987, almost 11 months after contract award, full delivery had been made on only six of the 24 line items. Partial

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[4] Delco Systems Operations was the sub-contractor for the LAV-25 turret.

delivery had been made on six other line items. The majority of the remaining items were planned for delivery between August 1987 and January 1988. The situation was similar with the Delco contract. Delco was to provide 18 line items on an "as soon as available" basis. Delivery times for these items ranged between nine and 15 months.

Despite the Marine Corps' awareness of the infeasibility of 30-day delivery, the Marine Corps did not expect the extended slippage in delivery times associated with both contracts. But there were no other options realistically available. Thus, it took two and one-half years, from problem identification in August 1985 to delivery of contracted spares in early 1988, before the near-term recovery strategy could be fully implemented.

2. Long-Term Initiatives

While the Tiger Team wrestled with the problem of providing near-term relief, the Marine Corps recognized, for the first time, the potential for long-term supportability problems. Although many serious near-term problems existed, the inability to provide adequate supply support was the most serious long-term problem facing the program. To ensure long-term supportability, the following options were implemented.

a. Competitive Reprocurement

Competitive reprocurement is also known as second sourcing or multiple sourcing. Simply stated, as the

Government has a requirement for an item, instead of contracting with the original vendor, the Government simply solicits alternative price offers from other vendors to produce the item. This process requires at least two vendors who can produce the item. This appears to be an attractive option. Competitive reprocurement is simple in concept and desirable because it promotes the DOD goal of maximizing competition to minimize costs and it also helps maintain the vital defense industrial base [Ref. 12:p. 12]. But, in the case of the LAV-25, the Government was unable to competitively reprocure critical turret parts. Much of the technical data needed to manufacture the turret components was proprietary in nature. Proprietary rights are defined as those rights which an owner of property has by virtue of his ownership [Ref. 13]. Technical data are closely guarded in industry because disclosure of technical data could jeopardize the contractor's competitive advantage.

The Government did not own the rights to the proprietary turret technical data nor did it have access to the data. Thus, the Government was unable to solicit other vendors to manufacture the parts. The Government's inability to second-source needed spares and repair parts is the single most important issue underlying the ILS difficulties experienced by the LAV-25 program. Because it is central to long-term LAV-25 supportability, competitive

reprocurement will be examined in closer detail in Chapter III.

b. Sole Source Procurement

Continuing to purchase LAV repair parts sole source from original contractors presented several problems. The Government faced the problem of increased cost. Due to the sole source nature of the procurement, the vendor has the Government at a competitive disadvantage. Being the sole vendor gives the seller an advantage when negotiating price. Additionally, as sole source contractors re-tool their production lines to other functions, the cost to the Government of returning to the original contractor increases as contractor set-up costs increase. Unless the Government buys quantities sufficient to justify keeping a sole source production line open, contractors will show less and less interest in continuing to set-up and produce what will become, in essence, less and less profitable specialty lines. This is what happened to the LAV-25 turret components. Despite their monopolistic advantage, Delco and DDGM became less interested in supporting the small number of spares ordered because production and manpower expenses limited the profitability of these spares. Thus, as the LAV-25 production drew to a close, the Marine Corps faced the problem of diminishing spare parts production bases.

c. Reverse Engineer Turret Parts

The objective of a reverse engineering program is the development of a Technical Data Package (TDP) in order to enable the Government to competitively reprocure spare parts. Successful completion of reverse engineering should allow for competitive reprocurement. However, once the process is complete, there is no guarantee that industry will respond to solicitations to produce the reverse engineered item. The reverse engineering process is time consuming and expensive. LAV-25 turret parts considered for reverse engineering had to meet the following criteria:

- The part has limited or reduced sources of supply due to the nonavailablity of a TDP, an incomplete TDP or has a TDP that contains limited data rights.
- There is no knowledge or evidence of current patent rights.
- There is no security classification assigned to the part.
- The part is available to be loaned out to a contractor and such loan will not adversely affect not deplete required supply quantities.
- Loaning or viewing the part is not otherwise precluded by law.
- The part is not engineering critical or unstable.

Ten items on the LAV-25 turret were identified in May 1987 as reverse engineering candidates. However, due to a lack of funding, reverse engineering has not been completed on most of these candidates.

H. SUMMARY

This chapter has identified two main reasons for the Marine Corps' adoption of an accelerated acquisition strategy for the LAV-25. The first reason was the immediate need for improved strategic and tactical mobility for RDJTF forces. The second reason was the Marine Corps' need to provide increased firepower and mobility to compensate for significant firepower reductions occurring during the 1970's. The consolidation of the Concept Exploration, Concept Demonstration and Full Scale Development Phases into a single Phase was an important deviation from the normal acquisition process required by the LAV-25 accelerated acquisition strategy. This chapter has highlighted the innovative ILS measures taken to support the accelerated fielding of the LAV-25. Prominent among these measures were the RBL, BOA, 60-Day Mount Out List for supply support, an abbreviated LSA using data from several sources, and the use of commercial TMs for near-term technical publications support. Additionally, this chapter identified the inability to provide sufficient spares and repair parts, principally for the LAV-25 turret, as the primary long-term, unanticipated ILS issue arising from the accelerated fielding process. A significant and related issue is the inadequacy of the LAV-25 PPSP. Lastly, this chapter identified the near-term and long-term corrective measures taken to resolve the turret support problem. The emergency

procurement contracts awarded to CCC and Delco Systems Operations were the primary measures taken to provide near-term relief to the LAV-25 turret spares problem. Long-term relief was to be accomplished through a combination of sole source and competitive reprocurement replenishment buys along with reverse engineering of selected turret parts.

Appendix C contains a chronology of the significant events in the LAV-25 program.

III. THE IMPACT OF NDI ON ILS

A. INTRODUCTION

References to the LAV-25 as a non-developmental item (NDI) are found in many documents related to LAV-25 acquisition and support. From personal experience, the author is aware that the common perception among many Marines in LAV units is that the LAV-25 is a NDI. This perception carries with it the expectation that not only is the vehicle readily available, but the required support is readily available. But is the LAV-25 truly a NDI? This chapter will closely examine the characterization of the LAV-25 as a NDI. It will also examine the implications of NDI on competitive reprocurement.

B. THE LAV-25 AS NDI

NDI is a term that identifies material available from a variety of sources with little of no development required by the Government. The statutory definition of NDI is [Ref. 14]:

- Items of supply available in the commercial marketplace.
- Items of supply previously developed and in use by the U.S. military Services or Government agencies, state or local governments of foreign governments with which the U.S. has a mutual defense cooperation agreement.
- Items of supply described above that require only minor modification in order to meet the requirements of the procuring agency.

- Items of supply currently being produced but not yet available in the commercial marketplace.

The catalyst for increased use of NDI within DOD was the June 1986 Packard Commission Report. The President's Blue Ribbon Commission on Defense Management, also known as the Packard Commission, strongly advocated the use of off-the-shelf commercial products rather than items custom made to military specifications.

The advantages of NDI include reduced research and development costs, decreased procurement lead time resulting in more rapid delivery and fielding and use of current technology available in the marketplace. The disadvantages of the NDI approach include the possibility that the NDI might not meet all the essential performance requirements thereby requiring a tailoring of the requirements to fit the technology. Additionally, the modifications required for off-the-shelf items may become major modifications and undermine the intended NDI benefits. Significant maintenance problems can occur because of NDI and commercial product proliferation. [Ref. 15:pp. 10-11] A study by the Logistics Systems Analysis Office concluded that [Ref. 16:p. 20]:

> ...systems acquired without sufficient technical data and systems with unique/uncommon support items which are not similar in performance to existing inventory items will cause item proliferation.

Another disadvantage involves logistics support. Accelerating the ILS processes may result in omitting or not

covering in sufficient detail the ILS tasks required. For military designed systems [Ref. 16:p. 5]:

> ...initial provisioning for logistics support takes place during the production phase. The production phase is normally lengthy enough to accommodate the requirements for provisioning conferences, reviewing technical data and obtaining NSN's. An NDI system is already in production, and, therefore, ready (or close to ready) for deployment ....performing initial provisioning for an NDI system within the same time constraints as a non-NDI system can delay deployment.

NDI can be categorized as "off-the-shelf" or as "modified off-the-shelf." Off-the-shelf means just that. The item can be used "as is" without any modification. Modified off-the-shelf items require some modification before operational use. The LAV-25 is considered a modified off-the-shelf NDI. The 25 June 1982 Acquisition Plan stated [Ref. 9]:

> The program involves the acquisition of essentially non-developmental combat vehicles modified to meet specific requirements with the expressed purpose of improving the operational capability of both the United States Marine Corps and the United States Army.

Additionally, the initial LAV Integrated Logistics Support Plan (ILSP) stated, "The LAV has been designated as a non-developmental system because a significant number of its components are already marketable items." [Ref. 17:p. II-20]

The LAV-25 meets the statutory standards for classification as a NDI acquisition. But despite the desire stated in the RFP for an off-the-shelf vehicle, no vehicle actually in production was selected for testing purposes

[Ref. 3:p. 189]. While the acquisition of the LAV-25 can be classified as NDI, from an ILS perspective, the LAV-25 was not NDI. The time required to produce the vehicle and achieve IOC was greatly exceeded by the time required to establish full ILS. The production time for the 422 LAV-25s extended from November 1983 to May 1987. Although there can be no clear boundary marking full ILS attainment, ILS clearly was not fully effective when LAV-25 production was completed, as evidenced by the emergency turret buys.

Although the LAV-25 was characterized as NDI, the vehicle can be considered partly a NDI and partly a developmental item. This distinction can be drawn between the automotive hull and the turret. As stated in Chapter II, the design of the automotive hull was stable and repair parts were generally available. Design changes were expected in the turret. These design changes, combined with the difficulty in obtaining turret spare parts/repairables and the number of product improvements to the turret, clearly shows that the turret was developmental.

The extent of modifications required to an off-the-shelf item can call into question the classification of the item as NDI. As stated in Chapter II, the LAV-25 program was required by the MENS to contain a Product Improvement Plan (PIP). Product improvements are modifications to the vehicle to improve performance. The LAV-25 has had 21 approved turret product improvements. Numerous others for

both the turret and the automotive hull have been suggested but not yet approved.

The extent of NDI product improvements also suggests another pitfall of a modified NDI: the potential for the PIP program to serve as a substitute for design and performance improvements/changes that, in a developmental program, would be discovered and incorporated into design prior to production.

Careful screening of NDI candidates during the market survey is essential to ensure that a suitable NDI candidate is available in the marketplace. Since the purpose of the LAV-25 market survey was to identify potential candidates that could meet the operational requirements specified in the ROC, the screening was successfully accomplished in the LAV-25 program. From personal experience, the author is aware that the LAV-25 has been an operational success.

But choosing a NDI that requires excessive modification can cripple a program. The U.S. Army's experience with the Roland missile is illustrative of a NDI modified to the point of failure. Roland, the predecessor of the Sergeant York Division Air Defense System, was to be a large-scale NDI. However, the Army modified the missile right out of existence [Ref. 18:p. 9].

The success of the LAV-25 and the failure of the Roland serve to illustrate that NDI can be modified to meet some

requirements, but that in other situations a developmental approach is needed.

C. COMPETITIVE REPROCUREMENT

Spare parts procurement can be divided into two activities: initial spares procurement and spares replenishment. Initial spares are bought during the provisioning process. Provisioning is the process of selecting not only spare parts but a wide range of support functions needed to support the system when deployed. Initial spares are the spares needed to support initial fielding. Initial spares procurement normally occurs during the production phase and decreases as production draws to a close. Replenishment parts are those parts purchased after the parts are available in the supply system and a demand history or pattern has been established. Replenishment is the process of restocking the inventory as a result of parts being used by the operating and supporting activities. Replenishment spares procurement is limited during production and increases as the weapons system moves through its life cycle. It is during the process of replenishment that competitive reprocurement of spares becomes significant. [Ref. 19:pp. 151-153,158]

The Government can conduct replenishment buys in one of two ways: sole source or competitive reprocurement. Competition is the preferred method. But competition is not always possible. As stated in Chapter II, competition for

the LAV-25 emergency spares procurement contract was desired but not forthcoming. Competition could not be introduced because potential vendors could not possibly compete without access to the proprietary data needed to produce the items. Central to the issue of multiple sourcing is the issue of data rights.

The Government has extensive need for many kinds of technical data. It is DOD policy to acquire only such data as is essential to meeting Government needs. Technical data rights can be classified as unlimited and limited, as defined below [Ref. 20:p. 5-18]:

- Unlimited rights establish the right to use, duplicate or disclose technical data in whole or in part in any manner and for any purpose whatsoever, and to direct or permit others to do so.
- Limited rights establish the right of the Government, or others on behalf of the Government, to use duplicate, or disclose data, but not outside the Government without written permission.

Unlimited rights are acquired automatically if the data are developed at Government expense and are identified as a contract deliverable. Limited rights serve to protect technical data developed at private expense. Because the Government did not fund the development of the LAV-25, the Government had only limited rights to LAV-25 technical data. Thus, much of the technical data concerning the LAV-25 turret parts were proprietary in nature and could not be used by the Government for competitive reprocurement purposes.

For competitive reprocurement of spares, four principal methods exist to conduct the technology transfer necessary to create a second source. They are Technical Data Package (TDP), Reverse Engineering, Directed Licensing, and Breakout.

1. Technical Data Package (TDP)

The TDP presents a detailed description of the item being procured. The TDP is a complete set of plans, engineering drawings, associated lists, specifications, standards, models, performance requirements, quality assurance provisions and packaging data and may range from a single line item to thousands of pages of documentation [Ref. 21:p. 34]. The engineering drawings are available in three levels. Level 1 drawings provide detail sufficient to evaluate preliminary design. Level 2 drawings support manufacture of production prototypes. Level 3 drawings provide engineering detail sufficient to make a reproduction of the item. It is the Level 3 drawings that are needed in order to allow the Government to compete a replenishment spares procurement contract.

The critical issue regarding the TDP is access to the data contained in the Level 3 drawings. The Government can obtain access to the data in one of two ways: the Government can buy the data rights in their entirety or it can negotiate compensation for access to only that portion of the data needed for competitive reprocurement. An

accurate and complete TDP should allow for competitive reprocurement of spares, manufacture of identical items and provide an equipment baseline. But obtaining the TDP does not, in and of itself, assure that second sourcing will be successful.

The Government has the responsibility to validate, maintain and update the TDP to ensure correctness. This formidable task may delay the second sourcing effort if the Government underestimates the workload required in assuming TDP management responsibilities. Additionally, the TDP contains "know-how" which is an intangible difficult to put down on paper and is the factor most troublesome in implementing the technology transfer [Ref. 22:p. 42].

2. Reverse Engineering

The reverse engineering process was briefly described in Chapter II. Essentially, reverse engineering is the process of disassembling an item to its smallest components to discover the processes that make the item function in order to create a duplicate item that performs the same function. The result of reverse engineering allows the consideration of multiple sources of supply. As stated in Chapter II, reverse engineering can be a very time consuming, difficult and expensive process. It may not be suitable as a primary competitive reprocurement method.

3. Directed Licensing

In the directed licensing method, the system developer, in exchange for a royalty fee, grants permission or license to another firm to produce an end item of proprietary interest to the developer. The licensing approach should be used only when the system developer refuses to grant the Government unlimited data rights, as was the case with LAV-25. The system developer, under the licensing concept, grants only limited data rights to the second source. The system developer maintains proprietary interest in the data and retains design responsibility. Licensing provides for the transfer not only of technical data but of the intangible "know how" not provided by the TDP. The license approach reduces the administrative burden of the Government because the technology transfer is accomplished between vendors. However, the use of royalty fees may increase the cost of the spares. Additionally, there may be a problem of licensor motivation. The licensor may be uncooperative and reluctant to assist the licensee. Because the licensor retains proprietary control over item design, technology transfer may be slower than desired and result in longer lead times for competitively reprocured spares to reach the user. [Ref. 23:pp. 2-13,2-15,12-1,12-5].

4. Breakout

Breakout is a program which identifies high value or high demand items for which competition is desired during replenishment. The primary purpose of breakout is to reduce the cost of repair parts by breaking the part out; that is, purchasing the part from other than the prime contractor. In the breakout process, parts are comprehensively examined to determine whether or not a part can be competed. The breakout process is subject to the same restrictions on technical data availability as all other competitive reprocurement processes. Competitive reprocurement of parts that fail breakout selection due to technical data restrictions must be achieved by another method, such as reverse engineering or directed licensing.

None of the above listed second sourcing methods was originally adopted in the LAV program. The TDP was not purchased because of the NDI nature of the program [Ref. 9:p. 16]. However, very early in the program, consideration and acknowledgment were given to the potential need for establishing a second source program. One section of a draft LAV acquisition plan, dated 3 August 1981, stated:

> Competitive data, including proprietary rights and patent data. This is a competitive acquisition which will have a price option for an assignable license to create a second source. It is planned to have a predetermination of proprietary rights in the production RFP.

However, no such predetermination was made. The LAV-25 production contract was awarded without any stipulations

that would permit competitive reprocurement of spares based on the manufacturer's technical data.

When the Government desires to introduce competitive pressure by establishing multiple sources without the benefit of unlimited data rights, technology transfer from one vendor to another is required. This technology transfer cannot be accomplished without the willful cooperation of the owner of the data rights. Only after the LAV-25 turret parts problem received the continued and persistent high-visibility attention of the Commanding General, MCLBA, did the contractor reluctantly agree to consider a second source method for turret parts.

On 23 June 1987, a supplemental agreement to the LAV-25 production contract was approved stating the following:

> The Contractor will grant to the Government limited license rights in data for the LAV-25 turret spare/repair parts that are currently coded in the LSA as PA-SMR....The Contractor shall not be obligated to provide to the Government limited license rights in technical data for lower-tier vendor proprietary items....The Government will be allowed to provide the limited license rights technical data granted in accordance with this contract section to third parties who have prior executed data exchange agreements with the Contractor for the sole purpose of bidding and performing on spare/repair parts contracts with the Government....

This was a step in the right direction but it was not a panacea. There were still proprietary restrictions on data belonging to lower-tier vendors. The problem of timeliness also still existed. Developing multiple sources and providing tested, fully functional parts to the FMF would be

a time-consuming process. However, if multiple sources had been licensed and developed after the vehicle baseline had been established and prior to fielding the vehicle the supply system response time for second source LAV-25 parts might have been quicker.

D. ANALYSIS

The LAV-25 acquisition is representative of a fundamental problem associated with complex NDI: the seemingly unresolveable conflict between the Government's need for data so as to promote competition in reprocurements and the Government's responsibility to respect and protect the rights of private corporations/individuals who have developed data at their own expense. Private industry naturally feels that the Government does not adequately safeguard their rights. In a survey of 35 member companies by the Proprietary Industries Association, the 35 companies unanimously said that DOD policy on technical data discourages vendors' development/use of new technology in products sold to the Government and discourages industry participation in Government procurement [Ref. 15:p. 32].

Over the years, the Government policies have served, at one time or another, to restrict or to protect the rights of privately developed technical data. As an example of Government action taken to restrict privately developed technical data rights, the Secretary of the Air Force in September 1983 directed the use of a contract clause

limiting a manufacturer's rights in proprietary data to five years or less from the date of manufacture of the first production unit of a weapon system [Ref. 24:p. v]. Recently, however, the Government has taken action to protect privately developed technical data rights. Public Law 100-456 of September 1988 limits the Government's authority to require prospective developers or producers of major systems to provide proposals which would enable the Government to use technical data to obtain future competition when acquiring items or components of the weapon system, where the items or components were developed exclusively at private expense [Ref. 25:p. 16]. But regardless of technical data rights policies, the Government always has the ability to negotiate the data rights accessibility for competitive reprocurement purposes prior to awarding the production contract if it chooses to do so.

In a developmental acquisition, the time to ensure that the Government's data rights interests are protected is during the design competition when competitive pressure assists the Government in negotiating data rights. Contractors are more willing to resolve proprietary data issues in a competitive environment rather than a non-competitive environment. In the LAV-25 NDI acquisition, the opportune time to ensure the Government's data rights interests were protected was during the Phase I competition prior to award of the LAV-25 production contract. It was

during that time that the Government had the advantage of competition to provide incentive for the LAV-25 production candidates to negotiate for future second sourcing. By not considering future second sourcing, the LAV-25 was locked into a sole source replenishment method for parts containing proprietary data. The restrictions imposed by Public Law 100-456 make it all the more imperative that the Government negotiate a mutually acceptable data rights agreement prior to contract award, while the Government still has negotiating leverage.

Numerous examples exist of systems acquisitions, both developmental and non-developmental, where failure to adequately consider the potential for future competition of replenishment spares has resulted in higher prices and lengthy delays in providing parts for the field. A recommendation that emerged from the NDI Beretta Pistol acquisition called for competing spare parts, if possible, with the end item [Ref 26]. The Sergeant York[5] program, nominally a NDI program, experienced difficulties in competitive breakout and recommended pursuing strategies for procuring replenishment spares and resolving proprietary data claims early in the program [Ref. 27:pp. 1-04,05].

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[5]The Sergeant York program has been cancelled and is considered to be a prime example of all that is wrong with the acquisition process. Nevertheless, the ILS lessons learned are creditable and germane .

Herein lies an essential dilemma associated with major NDI as evidenced by the LAV-25 program: the NDI concept relates to acquisition considerations alone. The NDI concept does not give sufficient consideration to the impact of ILS on the classification of a program as NDI. The NDI definition may be suitable for simple, everyday items such as cots, flashlights and light bulbs. But for larger, more complex systems requiring ILS, the current NDI concept is insufficient and requires expansion. It is important to recognize that in some military acquisitions the ILS package provided by the contractor will be satisfactory because the item will be used in an environment identical or similar to the commercial environment. But, for some acquisitions, the range of ILS required may exceed that provided by the contractor because the unique military application and environment exceeds the normal commercial use.

The Army has expanded the basic definition of NDI to include categories of development required [Ref. 16:p. 4]:

- Category A: Off-the-shelf items to be used in the same environment for which the items were designed with little or no development required.
- Category B: Off-the-shelf items to be used in an environment different than that for which the items were designed with some development required.
- Category C: Integration of existing componentry and the essential engineering effort to accomplish systems integration with research and development to integrate systems.

This expanded definition obviously does not give sufficient consideration to the impact of ILS. The author proposes

that DOD adopt, as listed below, a modified version of the Army's categorization of NDI to more accurately describe the ILS requirements of NDI systems.

- Category A: Off-the-shelf items to be used in the same environment for which the items were designed with little or no development required. These items require no logistics support beyond that already provided.

- Category B: Off-the-shelf items to be used in an environment different than that for which the items were designed with some development required. These items require an additional level of logistics support that can be provided or developed in a timeframe sufficient to support the full range of anticipated use.

- Category C: Off-the-shelf items requiring extensive additional logistics support beyond that which can be provided during the initial fielding and operational deployment of the system. Tailoring of these additional ILS processes may be necessary to support initial fielding. An expanded PPSP is required to ensure life cycle support.

A number of ILS risks were identified early in the LAV program. In the LAV Risk Management Plan, the problems of compressed ILS planning time and an accelerated acquisition schedule were acknowledged:

> Concurrency and compression of ILS planning is cause for concern....Given the accelerated acquisition schedule, an ILS schedule which is not only compressed but is not completed until the initiation of the LAV production phase increases the risk that: (1) ILS requirements and data inputs into the Testing and Evaluation Program will be insufficient; (2) Supportability deficiencies will not have been sufficiently identified before production; (3) Greater reliance, hence dependence on the contractor will increase the probability of shortfalls in Marine Corps ILS preparations for the development of the LAV....In contrast to full-scale material development, off-the-shelf acquisitions give a user very little opportunity to influence the support characteristics of a system. Further, an off-the-shelf acquisition program increases the need for an ILS posture, for entry into the deployment and operation phases, wherein support elements are already

in position and in operation and have the flexibility to absorb off-the-shelf system peculiarities.

The ILS concerns stated above accurately reflect many of the problems that came to pass in the LAV-25 program. By 30 June 1987, the LAI Battalions were not yet capable of executing their full range of missions. Personnel issues, such as the lack of scout infantrymen contributed strongly to this condition. The Naval Audit Service reported that the following additional factors contributed to degraded equipment readiness [Ref. 28:p. 7]:

- The ordering of repair parts was delayed because adequate and timely data on technical drawings and secondary sources of supply were not available.

- The LAV Battalions were provided draft copies of LAV maintenance manuals and parts lists when the vehicles were delivered. However, the drafts did not contain up-to-date configuration data, and up-to-date manuals and parts lists were not published because the contractor had not yet identified and incorporated all engineering changes in the drafts.

- The LAV was basically an off-the-shelf item procured in an accelerated manner. In selecting this acquisition method, the Marine Corps was aware that equipment support would suffer for a few years.

LAV-25 acquisition planning definitely was aggressive and proactive. But regarding long-term supportability, ILS planning was reactive.

The LAV-25 contract was a production contract. As such, the LAV-25 principal manufacturers, DDGM and Delco, were focused on the terms of their contract: produce 422 LAV-25s. The contractors were not focused on post production support and long-term sustainability issues. But this is

not an inherent fault or weakness of the LAV-25 producers. The contractors provided the products and services required by the Government. The Government did not focus on post production support and long-term supportability. The Government was oriented to producing the vehicle in a timeframe sufficient to achieve IOC [Ref. 29]:

> The LAV Program will feature an accelerated acquisition approach designed to achieve IOC in the minimum possible time and at an affordable cost. Success is based on procuring hardware to a maximum degree compatible with the effectiveness desired for the run-off[6]. Elements such as logistics support, publications and training will be emphasized in the production phase where costs for the elements will be associated with only one contractor.

This passage reveals the primary importance of cost, schedule and performance as a consideration in the source selection process. It also reveals the secondary importance of ILS as a consideration in source selection process. Rather that incur the higher costs associated with having each competitor develop and present their full ILS capabilities as an evaluation area in source selection, ILS development was delayed until after award of the production contract. Costs of ILS development would then be incurred by only one contractor. Thus from the beginning of the program, ILS concerns were secondary in importance.

The LAV-25 accelerated acquisition understandably produced an up-front/near-term focus. But in a major NDI, just the opposite is needed. With so little time to prepare

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[6]Run-off refers to the competition between the four candidates for the production contract.

support to last the lifetime of the vehicle, the attention paid in the near-term to the long-term post production support becomes critical. The Government must have contractual safeguards built into a NDI production contract to ensure long-term supportability.

E. SUMMARY

From personal experience the author is aware that the lack of a TDP is the reason most often cited by FMF Marines as to why the turret parts problem existed. This attitude can be summarized as "The parts problem is bad because the Marine Corps did not buy the TDP." This is a popular, and attractive idea, but it is too simplistic. Having a TDP is not a guarantee of competitive reprocurement success. As outlined above, possessing a TDP is replete with opportunities for problems that could delay, and even prevent, competitive reprocurement success. For the accelerated acquisition of the LAV-25, the challenge was to accurately forecast demand, without usage data, in order to obtain sufficient spares concurrent with production. Generally, this procedure was successful. The LAV-25 contains 7975 items, 2065 of which are turret items and 5910 are automotive/hull items [Ref. 30]. The emergency spares procurement contract was to DDGM for 24 items and to Delco for 18 items in varying quantities. Yet significant difficulties were experienced in procuring these replenishment items. A more accurate assessment of why the

Marine Corps had a turret parts problem is that the Marine Corps did not give sufficient consideration to competitive reprocurement and long-term supportability considerations prior to award of the LAV-25 production contract.

To some extent, the LAV-25 program was a pioneer in NDI acquisition. The Packard Commission Report, calling for greater use of NDI, was issued four years after the NDI procurement of the LAV-25. Strong arguments can be made both for and against classifying the LAV-25 as a NDI. The author believes that the LAV-25 was not truly a NDI. The LAV-25 stands as an example of the extremely subtle and fine distinction between modified NDI and NDI that evolves into a developmental item.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

The focus of this thesis was on the major ILS lessons to be learned from the LAV-25 program. The author believes the following conclusions and recommendations represent the major lessons learned from the LAV-25 program.

B. CONCLUSIONS

The current concept of NDI does not give sufficient emphasis to the impact ILS has on the NDI nature of the program. ILS considerations can fundamentally alter the NDI nature of a large program if they differ from those in place. Off-the-shelf may adequately describe the availability of the hardware but it does not describe the capability of the system to fight and be sustained in combat.

Planning for competitive reprocurement for a large and complex system procured in an accelerated acquisition, such as the LAV-25, must be accomplished before the production contract is awarded. NDI has its applications but it is not a panacea for acquisition problems. NDI essentially locks a program into a sole source, unless steps are taken to early on to ensure future competition. The problem of data rights access exists in developmental as well as NDI acquisitions. But because of the compressed timeframe associated with NDI

ILS, the problem can be more acute with NDI. A balance must be struck between the requirement to ensure long term supportability and the need for vendors to protect their data rights. The earlier in the acquisition a competitive reprocurement methodology is considered and planned for, the more effective it will be when production is completed.

In an accelerated acquisition, ILS flexibility is a prerequisite to long-term supportability, which must be built into the source selection process. The best way to ensure flexibility is inclusion of a comprehensive PPSP. In an accelerated acquisition where there is insufficient time available to fully develop ILS, flexibility is a must. A "cradle to grave" approach is imperative. The PPSP is the key to ensuring the flexibility necessary to provide "cradle to grave support" will be available. Without a PPSP, the Government has very few options available for long-term support. In the LAV-25 program, the absence of an adequate PPSP meant that the BOA was the only mechanism available to ensure the LAV-25 production base was maintained. The BOA was the only device that tied the contractor to the vehicle as a source of support. More flexibility must be built into large, complex NDI to allow for future growth and support.

Some ILS considerations simply cannot be accelerated. There is no substitute for the time required to produce quality TMs, TMDE, tools and facilities. Operational planners must recognize this and be aware of the risks of

limited ILS when establishing IOC and deployment plans for items procured in an accelerated acquisition.

C. RECOMMENDATIONS

A full LSA should be a requirement of the source selection process so that LSA can be completely evaluated prior to production contact award. The Government relinquishes its ability to ensure supportability requirements are incorporated into design when the Government does not have the LSA prior to production contract award.

ILS must receive equal consideration with other requirements. DODI 5000.1 requires that:

> Logistics supportability requirements...shall be established early in the acquisition process and be considered in the formulation of the acquisition strategy. They shall receive emphasis comparable to that accorded to cost, schedule and performance objectives and requirements.

In the LAV-25 program, this was not the case. The common attitude expressed in the FMF was that the vehicle was intentionally fielded as quickly as possible and ILS would have to "catch up." Such an approach is not necessary if ILS is evaluated equally with cost, schedule and performance considerations.

It is easy to understand how cost, schedule and performance considerations could dominate a program constrained by time and driven to achieve IOC. But if the NDI requires a level of ILS different than or beyond that

which can be provided by the manufacturer, the success of a program can be jeopardized if the system is operationally deployed in response to a crisis without the full range of support available.

For NDI systems, supply support should be a major evaluation area in the source selection process. The issue is whether the manufacturer's spares and repair parts concept satisfies the user's needs. To determine this, competitors for production contracts should be evaluated on their ability to provide spares and repair parts as a separate area in the source selection process. Competitors can be evaluated as to technical data, breakout, first and second sourcing plans for repair parts, and post production support. In NDI acquisitions such as the LAV-25, where contractor claims of limited data rights are virtually guaranteed, evaluation of supply support is all the more important when the nature of the contract locks the Government into a sole source environment.

The concept of NDI currently in use by DOD should be expanded, as follows, to allow for the significance of ILS:

- Category A: Off-the-shelf items to be used in the same environment for which the items were designed with little or no development required. These items require no logistics support beyond that already provided.

- Category B: Off-the-shelf items to be used in an environment different than that for which the items were designed with some development required. These items require an additional level of logistics support that can be provided or developed in a timeframe sufficient to support the full range of anticipated use.

- Category C: Off-the-shelf items requiring extensive additional logistics support beyond that which can be provided during the initial fielding and operational deployment of the system. Tailoring of these additional ILS processes may be necessary to support initial fielding. An expanded PPSP is required to ensure life cycle support.

APPENDIX A

MISSION ELEMENT NEED STATEMENT (MENS) FOR THE LIGHT ARMORED VEHICLE (LAV)

This appendix contains the MENS for the LAV program. The MENS defines both the operational requirement for LAVs and the requirement for accelerated acquisition of an "off-the-shelf" system.

THE SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

8 MAY 1981

MEMORANDUM FOR SECRETARY OF THE ARMY
SECRETARY OF THE NAVY

SUBJECT: Mission Element Need Statement (MENS) for the Light Armored Vehicle (LAV)

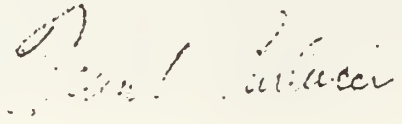
The USMC Mission Element Need Statement (MENS) for the Light Armored Vehicle is approved. To expedite this urgently required program, extraordinary means will be taken to tailor the acquisition process to meet the planned IOC of 1983 which I consider the first priority. At present, the LAV is to be treated as a non-major system except that a fully-structured Test and Evaluation Master Plan, keyed to the system acquisition plan, must be presented promptly to the Director Defense Test and Evaluation for review and approval. When Army requirements are defined and the total magnitude of the program warrants it, we may change the designation to "major" at that time.

The Army has indicated a need for a similar vehicle but currently lacks funding. Moreover, the Army MENS has not been submitted for final approval. Notwithstanding these facts, the need for both Services to acquire light armored vehicles is recognized. Because of the similarity of needs, only one program to acquire a near-term light armored vehicle program will be supported; it must meet the needs of both Services.

In view of the above, the Army's experience in acquiring armored vehicles, the history of cooperation which has marked earlier programs in which the Army acquired equipment for the USMC, the Army is designated as the contracting agency with overall acquisition responsibility for the USMC LAV program. The Army will support fully the USMC requirements. The USMC planned IOC of 1983 must be met and the Army acquisition process must be flexible enough to permit this. Since the LAV will be used by two Services, the Army, in carrying out acquisition responsibilities, must insure USMC representation. At a minimum, the Program Manager will be a Marine officer and the Source Selection Evaluation Board will be chaired by the USMC. The acquisition strategy should incorporate planning and funding for Preplanned Product Improvements to substantially reduce manpower and logistic support requirements.

One area where we have been rightly criticized is a failure to provide suitable NBC capability. The Army and USMC must seriously consider this threat. If feasible a capability to operate effectively in an NBC environment should be incorporated in the vehicles first fielded. If this capability is not achievable when the first vehicles are fielded, the acquisition approach should include the provision of this capability as a planned product improvement. Additionally, the Army should participate in and support the test and evaluation of the various contractor vehicles. Independent user evaluations should be provided by the Army and the Marines to the Source Selection Advisory Council and production decision recommending bodies in sufficient time to influence their final recommendations.

I expect the Army and USMC to acquire essentially the same vehicle. The needs are basically similar and meeting them is long overdue. Every effort will be made by both Services to expedite delivery of this urgently required system. I have directed that the USDR&E intensively monitor this program to insure that critial milestones are accomplished and the IOC of 1983 is met.



MISSION ELEMENT NEED STATEMENT (MENS) FOR THE LIGHT ARMORED VEHICLE (LAV)

A. MISSION.

1. Mission Areas. The mission areas of Land Warfare (210) and Amphibious Warfare (235) encompass the efforts required for limited intervention as well as for major conflict. The Marine Corps' Air Ground Task Force (MAGTF), as a potential element to the Rapid Deployment Force (RDF), will be employed in either or both of these mission areas.

2. Mission Element Need.

a. As an amphibious force and as part of the RDF, the Marine Corps has unique capabilities which allow it to be responsive to the force projection aspects of national strategy. When the force is projected ashore and carries out subsequent operations in the Land Warfare (210) and Close Combat (211) mission areas, there exists an acute need for light weapons, combat mobility, firepower, air defense, and antiarmor capabilities.

b. Landing forces currently have limited mobility and direct gunfire support to engage and destroy enemy forces rapidly in both the amphibious assault and in subsequent operations ashore. To overcome these deficiencies, immediate requirements exist for a system having the following characteristics:

(1) Transportability.

(a) Strategic. A system is required which is capable of being lifted in required numbers by current strategic airlift assets.

(b) Tactical. In order to allow for its projection ashore with the helicopterborne assault elements, the system must be transportable by the CH-53E helicopter.

(2) Mobility.

(a) Rapid cross-country mobility and agility without degradation of on-road capability.

(b) Inherent mobility consistent with the cargo, weapons, or other systems carried (i.e., command and control, air defense, etc.) and the expected mobility of the threat.

(c) Swim capability.

(3) Protection.

(a) The survivability of the LAV and crew/passengers requires, as a minimum, protection against 7.62 mm ball ammo and 50 ft air burst of 152 mm artillery fire.

(b) NBC attack detection and protection.

(4) Firepower. Variants of the LAV will possess differing characteristics and will be capable of mounting a variety of weapons and equipment, to include:

(a) A light assault variant mounting a gun capable of delivering effective suppressive fires while providing protection for embarked combat troops.

(b) An assault gun variant capable of engaging and destroying armored vehicles, materiel and personnel targets at ranges of at least 2000 meters, and providing effective suppressive fires against personnel targets with a secondary weapon system.

(5) Variants which provide capabilities in other mission elements will be investigated and may become candidates for procurement. These mission elements include, but are not limited to, Ground Air Defense (213), Mine Warfare (214), Land Combat Support and Combat Service Support (215 & 216), Fire Support (212), Tactical Command and Control (254) and Electronic Warfare and Counter - C^{3}I (257).

B. THREAT OR BASIS FOR NEED.

1. This threat assessment addresses those portions of the Amphibious Operating Area (AOA) from the line of departure for landing craft, inland to a depth of 45-50 kilometers and subsequent combat operations ashore up to a distance of 500 km. Projections are for the period Initial Operational Capability (IOC) plus 10 years. Threat capabilities are those of Soviet/Warsaw Pact forces and Soviet surrogate forces increasingly liable to be encountered in Europe, Africa, the Middle East, Asia and Latin America. In using the term "Soviet" to modify a threat capability or feature, attribution of a comparable capability or feature to a surrogate force is implicit.

2. As with all Soviet military doctrine, the principles of defense against amphibious assault have as their goal the creation of conditions which will allow the Soviet commander to initiate decisive action while denying the landing force commander this same capability. In furtherance of this goal, the Soviet defense is based upon high intensity mobility operations utilizing large numbers of tanks and armored fighting vehicles, extensive use of supporting arms and tactical aviation, and echeloned defense in depth deployed in an integrated combined arms concept.

3. As an outgrowth of this concept of defense, certain Soviet weapons systems will be of particular concern. The mobility, firepower and protection offered by tanks and armored fighting vehicles will afford the Soviet commander an advantage against Marine landing forces as they are presently equipped. This capability will be greatly enhanced by the introduction of the T-72/T-80 Series tanks with their vastly improved armor protection, power plant, armament, and fire control systems. More than 200 such vehicles will be encountered in a representative motorized rifle division, the primary tactical element in defense against an amphibious assault. Infantry mobility and fighting capability will also increase with the introduction of improved armored fighting vehicles of the BMP, BMD, BTR family, more than 400 of which will be encountered in the motorized rifle divison. The Soviet commander will also enjoy an increased capability to employ air and artillery-delivered ordnance against the landing force. Tactical aviation will expand dramatically with the widespread use of attack helicopters such as the Mi-8 (HIP), the Mi-24 (HIND) and their successors, as well as fixed wing attack aircraft such as the MIG-27 (FLOGGER-D) and its replacement, the

"ground support" fighter. Artillery will increase in both numbers and mobility, with the self-propelled 122mm and 152mm gun/howitzers playing an expanding role. An added dimension of serious proportions will be the Soviet capability and doctrinal willingness to employ nuclear munitions and conduct chemical operations utilizing a variety of incapacitating and lethal agents.

C. EXISTING/PLANNED CAPABILITIES TO ACCOMPLISH THIS MISSION.

1. Existing.

a. M60 A1 Tank;

b. TOW weapon system mounted on a 1/4 ton truck;

c. Dragon antitank weapon system;

d. Light Antitank Assault Weapon (LAAW);

e. Towed and self-propelled artillery (105mm, 155mm, 8in);

f. Fixed and rotary-winged aircraft;

g. Armored Personnel Carrier (APC)/Landing Vehicle Tracked (LVT);

h. Foreign Light Armored Vehicles.

2. Planned.

a. XM1 Tank;

b. Improved TOW on 5/4 ton truck (HMMWV);

c. Improved LAAW;

d. Improved artillery (M198, M110A2, Copperhead);

e. Aircraft ordnance (Laser Maverick);

f. Infantry Fighting Vehicle (IFV/LVT (X));

g. Mobile Protected Gun (MPG) (near term and far term);

h. Mobile Protected Weapons System (MPWS).

D. ASSESSMENT OF NEED.

1. The Need. Maneuver/Mechanized warfare is highly mobile and requires a family of lightweight armored vehicles to increase the tactical and strategic mobility of amphibious and Rapid Deployment Forces. The weapons systems on these vehicles will also fill the need for additional firepower on the battlefield.

2. Deficiencies in Existing/Planned Capabilities.

a. Tanks are not helicopter transportable, therefore limiting their force mobility, and are less agile than a light armored vehicle (LAV). For a given tactical or strategic lift capability, more LAV's can be lifted than the heavier tanks, thus enhancing mobility.

b. The family of truck-mounted or individually fired antitank missiles lack crew protection from ballistic projectiles, NBC detection and protection, and are less agile and mobile than an LAV.

c. Dragon, LAAW, and Improved LAAW provide an antiarmor capability but without a high degree of mobility, agility and protection for the crew.

d. During the initial phases of an amphibious assault, artillery fires are not immediately available to provide responsive support fire. Artillery mobility for the direct fire role is limited and the projected Copperhead's capability is limited by adverse weather conditions and availability of laser designator personnel and equipment.

e. Aircraft, including the antitank configured helicopters, are capable weapons, but their effectiveness is degraded in adverse weather conditions. The antitank role may be diminished due to priority demands or other degradation factors.

f. A variety of foreign and domestic vehicles and weapon systems exist or are planned which individually meet some of the requirements for a specific variant of an LAV. However, the required mixture of these vehicles (e.g., IFVs, MPWS, APCs, etc.) would be of such a dissimilar nature that training, support and combat interoperability would be highly complicated. Additionally, the aggregate of the mix would not provide the total capabilities required. Therefore, a common vehicle platform from which needed variants can be derived is required. For example, the MPWS and MPG will not provide variant capabilities nor will they meet the required LAV IOC.

g. The existing/planned LVT's are not helicopter transportable, and have limited strategic air transportability. The existing LVT does not provide significant fire support.

3. Exploitable Technological Opportunity. There exists today foreign and U. S. manufactured vehicles which, with proper armament/ancillary equipment, could fill the requirements for an LAV family. Currently available weapon systems will be considered in the evaluation and selection of the primary candidate to meet the desired IOC of 1983. However, to increase the firepower and mobility of the Marine Corps, as directed by the Consolidated Guidance, subsequent Pre-Planned Product Improvements are planned starting in FY82 to acquire additional variants such as the anti-tank, command and control and air defense.

4. Force Size. The LAV will be initially introduced into a battalion-sized unit in order to develop tactics. Ultimate organization of the LAV will be adjusted as determined by operational experience and pending a structure review.

E. CONSTRAINTS.

1. Timing of Need. The need for the LAV is immediate. The acquisition strategy must allow for the earliest possible IOC within the framework of the DoD system acquisition procedures.

2. Relative Priority Within the Mission Area. The LAV is a unique opportunity for the Marine Corps to add additional firepower and mobility to its RDF posture through a near-term procurement of an off-the-shelf vehicle. Therefore, the priority for the LAV ranks number one in the Land Warfare area and number three, behind increased amphibious lift and assault amphibians, in the Amphibious Warfare area.

3. Resources. In order to obtain the earliest possible IOC for this system, Congress has initiated added R&D funding to permit accelerated evaluation and selection of an acceptable candidate. The current funding profile (constant dollars) for the years 1981-86 is depicted in the following table to initiate the total anticipated procurement of approximately 750 vehicles to outfit and support three LAV battalions.

Fiscal Year	81	82	83	84	85	86
NUMBER OF VEHICLES	0	72	108	128	128	128
PMC (M$)*	0	49.9	72.0	82.9	84.3	85.9
RDT&E (M$)	17.0	10.2	11.6	10.3	5.8	2.0

*Includes provisioning and ammo.

4. Logistics, Safety, Health, Energy, Environment and Manpower Considerations.

a. Logistics. The current and projected Combat Service Support (CSS) procedures and structure will be adequate to support the introduction of the LAV with minor adjustments. A logistics support analysis will address the specific adjustments necessary to support the LAV units, to include probable contractor support.

b. Manpower. Initial manpower requirements are estimated to range from 900 to 950 enlisted Marines, and 46 officers per battalion (144 vehicles). Manpower analyses will be conducted throughout the acquisition process to optimize the numbers and skills requirements for operational, maintenance, and logistics support of the LAV. A plan to restructure Marine ground forces to accommodate the LAV battalions including an analysis of a battalion T/O has been initiated. Once this analysis is completed, training will commence to meet the LAV IOC of 1983. Maintenance personnel will ultimately depend upon the specifics of the vehicle system chosen. No adverse impact is anticipated for any affected OccFld. It is anticipated that maintenance staffing will be similar to that of organizations such as motor transport or tracked vehicle battalions. The first two LAV battalions will be manned within currently programmed end strengths. Manpower for the third battalion will be programmed for FY86.

c. Safety, Health, Energy and Environment. Due to limited impact on these areas, no constraints are envisioned.

5. NATO/DoD Rationalization, Standardization and Interoperability (RSI). The equipment to be purchased is to be an "off-the-shelf" product. Competition will be open to both foreign and domestic sources. RSI considerations will be fundamental to the evaluation and selection process and particularly to later developmental activities contributing to product improvement.

6. Critical Interdependencies. The program will be constrained by the availability of currently available off-the-shelf vehicles and weapon systems.

F. RESOURCES AND SCHEDULE TO MEET NEXT MILESTONE.

Due to the urgency of the need and the acceleration of the procurement process of an off-the-shelf vehicle, aspects of the Milestone I and II requirements have been consolidated to construct an LAV Acquisition Strategy. The request for proposals for candidate vehicles will be released during early 3rd Quarter FY81 and the six month test period will commence during the 1st Quarter FY82. The best available vehicle/weapon system will be selected by the Source Selection Authority and proposed at a Milestone III scheduled during the 4th Quarter FY82. The estimated funding projected to meet Milestone III is $17.0M.

APPENDIX B

LAV-25 TECHNICAL PUBLICATION FIELDING DATES

As stated in Chapter II, the goal for fielding LAV-25 technical publications was October-December 1984. Listed below are the actual LAV-25 publication fielding dates in chronological order. The following abbreviations are used: LI--Lubrication Instruction, TM--Technical Manual, SL--Stock List.

Publication	Title	Fielded
TM 8A192B-34P	Engine Intermediate Maintenance Manual	March 1984
LI 08594A-12-2	Automotive LI	July 1984
TM 08594A-10/2	Automotive/Hull Operators Manual	July 1984
TM 08594A-10/1	Turret Operator's Manual	October 1984
LI 08594A-12-1	Turret LI	October 1984
TM 08594A-34/9	Automotive/Hull Intermediate Maintenance Manual	July 1985
TM 08594A-34P/10	Starter Intermediate Maintenance Manual	August 1985
TM 08594A-34P/11	Alternator Intermediate Maintenance Manual	August 1985
TM 8A191B-34/1	Transmission	September 1985
TM 08594A-20/3	Turret Organizational Maintenance Manual	October 1985

TM 08594A-20/4	Automotive/Hull Organizational Maintenance Manual	October 1985
TM 08594A-34/8	Turret Intermediate Maintenance Manual	December 1985
SL 4-8A191B	Transmission Repair Parts List	April 1988
SL 4-08594A-1	Turret Repair Parts List	April 1988
SL 4-08594A-2	Automotive/Hull Repair Parts List	April 1987

APPENDIX C

LAV PROGRAM CHRONOLOGY

Date	Event
July 1978	MPWS ROC established.
November 1979	RDJTF established.
11 December 1980	LAV ROC approved.
8 May 1981	LAV MENS approved.
5 June 1981	USA/USMC joint program office established.
14 April 1981	Phase I (Testing) RFP released.
11 September 1981	Phase I (Testing) contract awarded.
1 December 1981	Phase II (LAV-25 Production) RFP released.
30 December 1981	Revised LAV ROC approved.
27 September 1982	Phase II (LAV-25 production) contract awarded to CCC for DDGM.
1 May 1983	Company A, First LAV Battalion is activated at 29 Palms, California.
28 November 1983	First LAV-25 production delivery.
29 December 1983	Army terminates their portion of the LAV-25 program.
16 January 1984	Initial delivery of 3 LAV-25's to ITS.
31 January 1984	Revised procurement profile is approved.
4 April 1984	Second LAV Battalion, Second Marine Division is activated at Camp Lejeune, North Carolina.

1 July 1984	IOC achieved by Company A, First LAV Battalion.
11 July 1984	MPWS ROC canceled.
4 December 1984	Plan approved redesignating Company A, First LAV Battalion to Company A, Third LAV Battalion.
31 May 1985	First LAV Battalion, First Marine Division is activated at Pendleton, California.
August 1985	Emergency LAV-25 spare parts procurement requirement indentified.
5 June 1986	Emergency LAV-25 spare parts procurement disapproved for lack of competition.
23 June 1986	Competitive RFP issued. No responses received.
July 1986	Delco asks for 120 day RFP extension. CCC agrees to submit a proposal.
August 1986	CCC proposal received.
3 September 1986	Contracts awarded to CCC and Delco for LAV-25 emergency spare parts.
11 September 1986	Third LAV Battalion, Seventh Marine Amphibious Brigade is activated at 29 Palms, California.
23 September 1987	Fourth LAV Battalion, Fourth Marine Division is activated at Camp Pendleton, California.
May 1987	Last of the LAV-25's is delivered to the Marine Corps.

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