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This Armored Family of Vehicles Final Report covers the efforts of a Department of the Army Special Task Force from the period June 1986 through August 1987.

The objectives of the Armored Family of Vehicles (AFV) program were to develop and field a force capable of defeating the threat to [SIC] the 90's, while at the same time significantly reducing system and force operations and support costs. Reduction in costs will be achieved through modularity, component commonality and multiple systems capabilities combined so as to achieve required effectiveness with more survivable, cost effective systems. Support structure savings in both active and Reserve Components and the training support base driven by systems/force savings will be specifically considered. Both peacetime and wartime structure and systems savings will be addressed. Other goals include increased deployability, ease of training, modular design for future improvement, fewer crew members, reduced battlefield signature; and increased battlefield supportability. (con't)

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Authors:

MG Sunell, Robert J.
COL Logan, James A.
COL Inman, Stephen E.
LTC Greene, Lee F.
LTC Gibson, Joseph W.
LTC Hallissey, Stephen C.
LTC Bryant, John T., III
LTC Robinson, Michael I.
LTC Aadland, Anders B.
MAJ Rozman, Thomas R.
MAJ Duvall, Richard G.
MAJ Winter, Ronald E.
MAJ King, Harold E.
MAJ Gregg, Robert B.
MAJ Tatum, Randy D.
MAJ Fil, Joseph F., Jr.
MAJ Buckstad, Robert D.
CPT Smith, Carleton M.
Mr. Nette, Robert
Ms. Conwell, Debra L.
Mrs. Mosley, Alice H.
Mr. Coffman, Richard L.
Mr. Stryker, Harm
Mr. Augustine, Ed
Mr. Bahnsen, John C., Jr.
Mr. Bisno, Chester J.
Mr. Brown, Sam A.
Mr. Cargile, Jim
Mr. Denby, Otis E.
Mr. Gilmore, Joseph R.
Mr. Graves, Richard T.
Mr. Harrington, Robert H.
Mr. Heisner, Ralph P., Jr.
Mr. Hurford, Ellwood C.
Mr. Kersey, Ian G.
Mr. Phalin, Frederick T.
Mr. Williamson, Earl W., Jr.

(U) AFV PHASE I REPORT ORGANIZATION

BOOK	VOLUME	TITLE	CLASSIFICATION
1	I	INTRODUCTION	S
	II	SCP	S
2	III	REQUIREMENTS DOC	S
	IV	THREAT	S
3	V	LOGISTICS DOC	U
	VI	SMMP	U
	VII	TEMP	U
	VIII	RSIP	U
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	X	BCE	S
7	XI	TRAINING	U
8	XII	FEA SPTG DOC	S
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(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) INTEGRATED LOGISTIC SUPPORT PLAN (ILSP)

ARMORED FAMILY OF VEHICLES (AFV)

(U) INTEGRATED LOGISTIC SUPPORT PLAN (ILSP)

(This Section Is Unclassified)

I. GENERAL.

A. INTRODUCTION.

1. Purpose.

a. This Integrated Logistic Support Plan (ILSP) will be used to define the goals, elements, and objectives necessary to ensure the successful development, management and execution of the Integrated Logistic Support (ILS) Program for the Armored Family of Vehicles (AFV). Although a part of the overall Program Management Documentation (PMD) for the AFV, this plan is designed to be used as a stand-alone document for ILS planning and management purposes.

b. This ILSP lays out the total ILS strategy for the AFV and serves as the action guide to be used by all ILS program participants. It prescribes materiel system acquisition events/processes (such as requirements documentation, design and systems engineering, contracting, MANPRINT, configuration management, reliability, availability and maintainability, and quality assurance) requiring ILS action, interface or support. It will be used by functional managers and technicians in other disciplines that have a direct or indirect impact on the AFV. ILS planners/managers for each AFV vehicle will insure that the standards and requirements set forth in this document are adhered to.

c. This ILSP will be periodically updated and appended in a timely manner to influence the requirements documentation and materiel development to ensure a high degree of supportability in concert with Army concepts.

2. Background.

a. The Armored Family of Vehicles (AFV) is a direct outgrowth of the 1984 Special Study Group Armor (SSGA) Study in which then LTG Vuono established a tasking to investigate the ancillary effects of its efforts on the future family of vehicles. In the SSGA report, the quantitative and qualitative superiority of threat forces were enumerated along with the need to radically improve the U.S. capabilities to get ahead and stay ahead of this threat. As a result, the first AFV umbrella O&O Plan was initiated in January 1985. In 1985, the Defense Science Board Summer Study reinforced the findings of the SSGA report. An environment of rising O&S and acquisition costs, decreasing resources, the aforementioned threat, various light force requirements and a need to accelerate modernization of the force resulted in the Chief of Staff's decision to establish an AFV Task Force. The charter for the Armored Family of Vehicles Task Force (AFVTF) was approved 11 February 1986 and the AFVTF became fully operational in June 1986. Office of the Secretary

of Defense approval for the Justification for Major System New Start (JMSNS) and umbrella O&O Plan occurred in fourth quarter, fiscal year 1986 (4Qtr FY86). As one of only five new start systems approved, the AFV concept is clearly a high priority program, impacting the total Army (to include active, National Guard and Resere components).

b. Funding for the AFV has been included in the FY88/89 Budget submission and the Program Objective Memorandum (POM). Currently, efforts are being concentrated on program planning, resource allocation and preparation for a 16 Star Review in August 1987 with subsequent entry into a Proof of Principle phase. If the 16 Star Review decision is favorable, management of the AFV is expected to be transferred from the AFVTF to a designated management organization during FY89. Efforts after this date will include a detailed Cost and Operational Effectiveness Analysis (COEA) and have the objective of attaining a Milestone I/II decision in 4th QTR FY 89

3. Application.

a. This plan covers the general ILS planning and management functions to be performed during the various phases of the acquisition cycle regardless of the specific configuration or acquisition strategy selected for the family. It is applicable to all mission requirements presently being considered for the AFV and will be adapted to incorporate any new subsystems/vehicles as needed.

b. Revisions and annexes to this ILSP will be written in a timely manner to influence requirements documentation and materiel development and ensure a high degree of supportability in concert with Army concepts.

c. This ILSP was developed for use in the Requirements/Tech Base Activities and early Proof of Principle phases. It includes all ILS program tasks that must be accomplished during this phase and projects those required during the Proof of Principle, Development Proveout and Production/Deployment phases. The greatest attention in the projection effort has been given to the Proof of Principle phase.

d. As vehicles are developed to implement the AFV concept, annexes will be prepared which identify unique attributes and/or significant variances.

4. Iteration.

This ILSP is iteration number 87-6, dated 6 June 1987. This and all following ILSP's will be identified by the year and month of publication. Paragraphs with substantive changes from Draft ILSP 87-3 will be highlighted in **bold print.** ILSMT members are to provide final comments concerning the initial AFV ILSP no later than 22 June 1987. Comments should be addressed to Director, AFV Task Force, ATTN: DAMO-AFV-M (CPT Smith), Ft. Eustis, VA 23604-5597. Recommendations for changes will be coordinated and staffed for inclusion in the next version of the ILSP. These changes will be subject to discussion at the next meeting of the AFV ILSMT, tentatively scheduled for 21-22 July 1987.

5. Abbreviations.

A list of abbreviations and acronyms used in this ILSP are contained in Appendix A.

B. End Item/Weapon System Description.

1. General.

a. The Armored Family of Vehicles will consist of an armored fleet based on advanced technology and commonality capable of defeating the threat of the late 1990's and beyond. The AFV fleet will significantly reduce overall costs of procurement, operations and sustainment. Where possible and feasible, soldiers will be replaced with robotics or suitable technology to quicken responsiveness in battle and reduce personnel costs and vulnerabilities. Improvements in combat capability will be realized in DA mission areas of Close Combat, Combat Support, Fire Support, Air Defense, C^4 and Combat Service Support (and in every TRADOC mission area except SOF and Aviation). The AFV will meet battlefield requirements for enhanced survivability, firepower, tactical mobility/agility, tactical and strategic deployability, rapid repair/replacement of damaged or destroyed equipment, lethality, reduced battlefield signatures and the ability to effectively rearm, refuel, resupply recover and/or evacuate. Through an approach based on commonality, modularity and multiple system capabilities, advanced technology systems will be developed and fielded which reduce training and logistic requirements and force the threat into a reactive mode in all theaters from the late 1990's through the opening decades of the Twenty-First Century.

b. The roles provided below reflect the most accurate data presently available. Actual characteristics of the individual vehicles of the AFV will continue to develop as O&O plans evolve and a Best Technical Approach (BTA) is established. This description will be refined in each successive stage of acquisition as the program becomes more defined.

(1) Future Armored Combat System (FACS).
(2) Future Infantry Fighting Vehicle (FIFV).
(3) Future Reconnaissance Vehicle (FRV).
(4) Directed Energy Weapons Vehicle (DEW-V).
(5) Mortar Weapon System Vehicle (MWS-V).
(6) Advanced Field Artillery System-Cannon (AFAS-C).
(7) Fire Support Combat Observation Lasing System (FSCOLS).
(8) Elevated Target Acquisition System (ETAS).
(9) Armored Rearm System.
(10) Armored Refuel System.
(11) Armored Resupply System.
(12) Nuclear, Biological, and Chemical Reconnaissance System (NBCRS).
(13) Sapper Vehicle (SV).
(14) Combat Earth Mover (CEM).
(15) Combat Mobility Vehicle (CMV).
(16) Combat Gap Crosser (CGC).
(17) Combat Excavator (CEX).
(18) Mine Dispensing Vehicle (MDV).
(19) Recovery Vehicle (RV).
(20) Maintenance and Repair System (MARS).

(21) Intelligence and Electronic Warfare Vehicle (IEW).
(22) Combat Support Smoke Vehicle (CSSV).
(23) Armored Escort/Security Vehicle (AE/SV).
(24) Armored Ambulance (AA).
(25) Battalion Aid Station/MEDEVAC (BASMED).
(26) Line of Sight-AntiTank (LOS-AT).
(27) Line of Sight-Air Defense (LOS-AD).
(28) Non-Line of Sight-AntiTank (NLOS-AT).
(29) Non-Line of Sight-Air Defense (NLOS-AD).
(30) Command Group Vehicle (CGV).
(31) Command and Control Vehicle (C^2V).
(32) Rocket and Missile System (RAMS).

c. Annexes for individual subsystems/vehicles will be prepared as O&O Plan annexes are approved for each vehicle in the family in conjunction with the determination of the BTA. Each annex will include a copy of the O&O Plan annex for the appropriate subsystem. If not included in the O&O Plan annex, the following subsystem information will be added to the Annex as it becomes available: a description of the overall subsystem/vehicle, including major secondary items to be incorporated; all components of the complete subsystem/vehicle as it is planned, including Government-Furnished Equipment (GFE), basic sustainment materiel (BSM) and other associated support items of equipment (ASIOE); a summary of performance requirements/goals, and the threat/technological breakthrough the subsystem/vehicle is being acquired to counter or exploit to the extent that they can be determined; and transportability requirements and means for deployment of the subsystem/vehicle.

2. EI/WS Software.

The AFV missions at present have not been sufficiently defined to establish clear software requirements. The family consists of a wide variety of systems which are likely candidates for software and firmware applications. In general, software demands for any vehicle can be divided between chassis (or common) requirements and mission specific requirements. As the program evolves, individual software requirements of a particular vehicle will be covered in that vehicle's annex. In addition, details on the AFV associated software may be found in the Computer Resources Management Plan (CRMP).

3. EI/WS Replacement.

a. It is envisioned that the AFV will replace the following vehicles (both currently fielded and projected):
M113 Family of Vehicles.
Bradley Family of Vehicles.
M1 Series Tanks/Vehicles.
M60 Series Tanks/Vehicles.
M48 Series Tanks/Vehicles.
M88, M88A1, M88A1E1/RV90.
M578.
SP Howitzers.
AVLB.
CEV.

M9 ACE.
M1015 (IEW Carrier).
M992/XM1050 Field Artillery Ammunition Support Vehicle (FAASV).
Selected Medium and Heavy Wheeled Vehicles.

b. Plans for fielding the AFV call for equipping and training a brigade with an entire AFV fleet every quarter to allow modernization of one division per year, including ARNG and USAR roundout units, beginning in FY97. This achieves the greatest benefits from commonality and reduces the period of turbulence caused by the introduction of new systems. As more detailed information becomes available, it will be incorporated into the AFV Material Fielding Plan (MFP).

4. Training Devices.

The AFV program provides for significant savings in training due to commonality among vehicles. To provide further O&S cost savings, maximum use of simulators to train AFV equipment operators is desired wherever cost effective and feasible. Training devices which allow drivers to gain experience in all weather, all road type/condition driving will be an integral part of the AFV development effort. As the AFV concept develops, additional information concerning training devices will be included in this plan. Additionally, vehicle annexes will identify unique training devices planned or needed to train maintenance and operator personnel.

C. Program Management.

1. AFV ILS Manager.

Director, AFVTF is responsible for management of the AFV during the Reqyuirements/Tech Base Phase of development. The Director has appointed the Deputy Director for Materiel as the AFV ILS manager and ILS Management Team (ILSMT) chairman. In 3d QTR FY89 a management organization similar to that depicted in Figure I-1 is projected. At the earliest possible opportunity, an AMC ILS manager and TRADOC ILS Program Planner must be designated to represent their organizations. Both before and after Milestone I/II, there will be full cooperation and coordination between these planners/managers to ensure successful planning, management and execution of the ILS program. The TRADOC ILS Program Planner will determine responsibility, as required, for preparation of vehicle ILSP annexes. For inclusion in the Initial ILSP, annexes are due no later than 22 June 1987

2. ILSMT.

Appendix B contains a copy of the ILSMT charter. This document provides a list of participating organizations, and points of contact for coordination of the ILSP. When published, the Logistic Support Analysis (LSA) Strategy and Plan will be provided as Appendices C and D, respectively. Working relationships with the AFV Test Integration Working Group (TIWG), Training Support Work Group (TSWG), MANPRINT Executive Steering Committee, and MANPRINT Joint Working Group will be

ORGANIZATION TO BUILD ARMY 21 WITH THE AFV

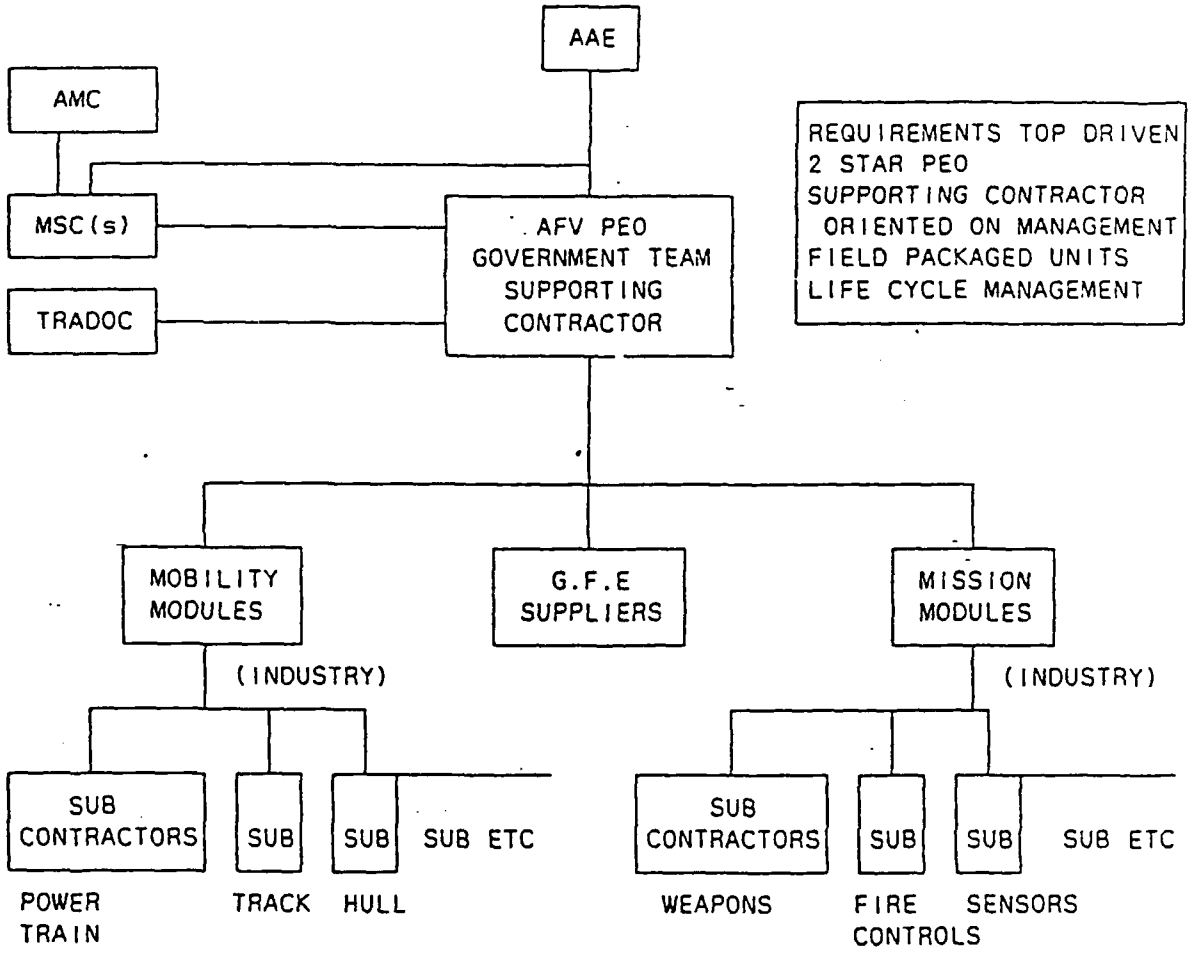

FIGURE 1-1.

coordinated as the program develops. For this phase of the program, necessary coordination with these organizations will be accomplished through their AFVTF members. Program Management Documentation produced by each of these organizations will be provided to the ILSMT members for review prior to publication. When necessary, subsystem/vehicle ILSMT's will be established and chartered by the AFV Program Executive Officer (PEO) IAW AR 700-127. These ILSMT's will be monitored by the AFV ILSMT.

3. ILS Joint Working Groups.

To insure that ILS annexes are written in a timely manner with a minimum of duplication and wasted effort, ILS Joint Working Groups will be formed at the discretion of the TRADOC ILS Program Planner. Appendix E will contain the charter and points of contact for these groups, as necessary. In accordance with the emerging concept of the AFV, it may be useful to organize working groups along assault, assault support and battlefield support affiliations or according to fighting vehicle sub-systems.

4. Collection of Logistic Test Data.

a. The Test and Evaluation Master Plan (TEMP) is a management document used by the TIWG to plan, coordinate and integrate all test requirements and scheduling. The Independent Evaluation Plans (IEP's) prepared by Early User Test and Experimentation (EUT&E) and Initial Operational Test and Evaluation (IOT&E) evaluators describe the necessary actions for gathering test data to ensure that the data collected is timely, reliable and in the proper format for evaluation. Evaluation results, as documented in the tester's Independent Evaluation Reports (IER's), will be used as supportive data for the Milestone Decision Reviews (MDR's). AFVTF (or the AFV management follow-on organization) will analyze these IER's to assess the logistic supportability of the AFV and will revise the TEMP to reflect any changes in logistic requirements for the AFV or any need for correction of support deficiencies.

b. Data collection will be a continuous process during system development. Data pertaining to repair parts, tools, test and support equipment, personnel skills, maintenance and supply support will be recorded in the LSAR and incorporated into the Technical Data Package (TDP). Specific data elements needed to develop manuals, provisioning documentation and personnel skills will be included in the LSAR contractual requirements.

c. Proposed Logistic Investigations to be performed during the subsequent acquisition phases will be included in Appendix F as they are identified.

D. Applicable Documentation.

Appendix G contains a listing of documents which provide guidance, parameters, performance characteristics, and other criteria for functions and requirements described in the ILSP.

II. PLANS, GOALS AND STRATEGY.

A. Operational and Organizational (O&O) Plans.

Due to the wide variety of vehicles/subsystems involved in the AFV, individual vehicle annexes will contain the information needed for input into the LSA process from their respective O&O Plans. These annexes will provide a brief description of the vehicle's mission scenarios and requirements, operational environment, transportability requirements, employment concepts, deployment plans, and combat service support force structure. Needed details (annual operating days, annual number of missions, mean mission duration, etcetera) should be available from these documents. Problems due to incomplete information should be brought to the attention of the ILSMT chairman as soon as possible. Prior to contract award for Development Proveout AMC, in conjunction with TRADOC, will prepare the LSA "A" data record format (Operations and Maintenance Requirements). Individual vehicle annexes will reflect changes to this information, if required.

B. System Readiness Objective (SRO).

1. As they become available, SRO's for each vehicle/subsystem will be included in this ILSP. Proposed SRO's for both peacetime and wartime requirements will be developed by the organizations responsible for each vehicle and integrated under the direction of the TRADOC ILS Program Planner. These will be forwarded for review by the AFV ILSMT for inclusion in the AFV ILSP no later than 4th QTR FY 89.

2. The TRADOC ILS Program Planner will ensure that anticipated or required operational availability (A_o) and full mission capable requirements are specified and included in each vehicle's annex. The TRADOC ILS Program Planner will ensure that this information is coordinated to produce a comprehensive A_o and full mission capable requirement for each chassis and mission module of the AFV prior to 4th QTR FY 89. Components and ASIOE which must be operational for a vehicle to be rated full mission capable should be included in the system description of its respective annex (Para I.b.1). Inclusion of AFV vehicles into the readiness reporting system will be decided during Development Proveout prior to Type Classification (TC) in accordance with AR 220-1, AR 95-33, and AR 700-138.

C. Acquisition Strategy.

A four phase approach will be pursued consisting of the Requirements/Tech Base, Proof of Principle, Development Proveout and Production/Deployment Phases.

The Proof of Principle phase will consist of technology base development of the major subsystems combined with AFV mock-ups, simulations, technology demonstrations and producibility assessments. These efforts will culminate in the selection of a family approach capable of defeating the threat through the opening decade of the Twenty-first Century while minimizing the overall cost of procurement, operations and sustainment. During this phase, simulators should be identified which will support both the design effort, New Equipment Training (NET), fielding, and sustainment training, once the system is fielded.

The Development Proveout Phase will consist of competitive development of the selected designs. This phase will include a design, fabrication and test of selected integrated chassis/mission vehicles, EUT&E, IOT&E and formal program review leading to a production decision.

The Production and Deployment Phase will consist of low rate initial production of the family of vehicles to initial production test (IPT)/verification. Upon successful completion of IPT, full rate production will be initiated. During this phase, low rate initial production will be begun after achieving Type Classification-Standard status.

It is anticipated that the AFV requirements cannot be met by product improvement, foreign purchase or non-developmental item acquisition. However, based on the size and complexity of the program, each of these acquisition methods may play a role in the final development of a vehicle/subsystem or component. Because of the need to provide our forces a technological advantage over the threat while significantly reducing O&S costs, a new development is likely to be required. Contractual approaches and incentives to accomplish the mission are discussed below.

1. Life Cycle Cost (LCC).

During the Requirements/Technology Base Requirements Activities Phase, a Firm Fixed Price (FFP), "Best Effort" type of contract was awarded to three contractors for the development of concept designs and evaluations for the AFV and associated technical and logistical documentation. To foster competition and competitive pricing, these three contractors will continue to be used during the Proof of Principle Phase. Contracts awarded during this phase will include a requirement for comprehensive LSA, MANPRINT, testability and producibility programs. Actions to reduce LCC will be considered on an equal basis with performance, schedule and risk during system trade-off studies and in decisions on design detail. An initial goal of LCC reductions by 20% has been established for the AFV fleet. Life cycle cost estimates will be prepared in accordance with AR 11-8 and DA Pam 11-2, 11-3, 11-4 and 11-5. Life cycle cost estimates will be based upon the data and information contained in the current material system requirements specification (MSRS) for the system. Close coordination between the program director, subsystem/vehicle ILS managers, other government agencies and the contractors is required to keep costs down.

During the Development Proveout Phase, support cost guarantees will be negotiated with respective contractors. Design to cost goals will be established and closely monitored during the acquisition cycle. Reliability incentives and reliability improvement warranties will be negotiated as well.

Acquisition of spares will be integrated in the system/end item initial production contracts or otherwise specifically provided for. Contractor support is anticipated during the Production and Deployment Phase and may be used until final Test Program Sets are fielded. During the Proof of Principle and/or Development Proveout Phase, an Engineering Design Contract to simplify initial design concepts, to reduce size and weight and to address maintenance issues will be considered.

2. Support Risks.

The risks associated with the system support are considered moderate. The AFV will be designed for simplicity of repair; simple enough that the operator and crew will be capable of repairs which are presently performed by organizational level maintenance personnel. The AFV will be modular in design and will incorporate Built-In-Test (BIT) software and BIT equipment (BITE) to fault isolate/detect to the Line Replaceable Unit (LRU). During the Requirements/Tech Base phase LSA will be accomplished to answer the following:

a. What are the effects of having the operator assume and increased amount of unit level maintenance?

b. What are the impacts of a support concept required to support a battalion of 2 armor companies and 2 mechanized infantry companies?

c. What are the CSS force structure impacts of implementing an AFV concept?

3. Training, Manpower, Skill [Manpower and Personnel Integration (MANPRINT)] Requirements.

Extensive use of the principles of MANPRINT will be incorporated into the LSA/LSAR process through the activities of the AFV MANPRINT Joint Working Group. Subsystem/Vehicle annexes will include specific information applicable to each vehicle. These will describe the goals and actions taken to reduce the quantity and skill of personnel operating and maintaining the vehicle. Complete MANPRINT information will be provided by the AFV SMMP.

4. Source Selection.

Early LSA tasks will be used to identify areas of greatest operation, maintenance and support cost savings. These will be provided to government technical and cost personnel for use in the source selection evaluation. The source selection board will consider ILS and MANPRINT as separate major areas for evaluation of bids. ILS/LSA and MANPRINT will be weighted equal to or greater than cost, performance or schedule. Due to severe funding and time constraints, contractor work during Proof of Principle will be executed through contract modification of the Firm-Fixed-Price Requirements/Tech Base Activities Phase study contracts. To foster competition and reduce acquisition costs, contracts awarded during the Development Proveout Phase will be cost plus incentive fee contracts. For the Production/Deployment Phase, a fixed price plus incentive fee contract will be used. It is anticipated that 2 single year production contracts will be awarded followed by 5-year multi-year contracts for the remainder of the program.

5. Reliability, Availability and Maintainability (RAM).

Through the accomplishment of early LSA tasks, major LCC savers will be identified. Those applicable to RAM will be incorporated into procurement contracts through the use of incentive awards. RAM incentives will be identified by the Materiel Developer IAW RAM goals established in the AFV ROC. As a goal, a total of 10% of the funds allocated to procurement of the AFV will be applied to these incentive awards.

6. Elements of Support Acquisition.

Full organic depot level maintenance (DLM) support is planned to be in place no later than 2d QTR FY96. In the event that organic DLM cannot be achieved for some system components by FUE, Interim Contractor Support (ICS) will be utilized. The need for ICS will be determined through LSA and documented accordingly in the LSAR (Card B06, Block 9/"B" sheet) per MIL-STD-1388-2A. Sources of ASIOE and its availability will be defined for each vehicle in its ILSP. Contractor Logistic Support (CLS) for depot level maintenance of integrated propulsion units and selected other major assemblies will be determined prior to Production/Deployment based on an economic decision analysis (IAW AR 700-XX, AR 700-127 and AR 700-17) and consideration of mobilization requirements.

7. Transportability.

Transportability requirements (modes, transport times/schedules) specified in O&O Plan annexes for each AFV vehicle/subsystem will be analyzed as part of LSA Task 201, Use Study, and LSA Subtask 303.2.12, Transportability Trade-offs. Resultant supportability impacts and transportability constraints will be incorporated into the ROC and subsequently into contractual documents. Before release of the Development Proveout request for proposals (RFP), these documents will be reviewed by the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA). Following contract award, transportability will be examined at each program status review meeting. Current contracts will be modified to include Data Item Description (DID) DI-L-3327 for each conceptual AFV vehicle/subsystem developed. This will be a deliverable during 1st QTR FY 89. An initial Transportability Study based on the TACOM conceptual AFV Study has been conducted by MTMCTEA and is included in this volume.

8. Other Data.

To achieve its goals, the AFV Program Planner must minimize changes in requirements. As any change to one vehicle will affect the other vehicles in the family (due to common components), changes must be strictly controlled. As an accelerated acquisition, it is critical that front end analysis be conducted in a much more thorough manner than is normal to avoid wasting time and resources. The program must seek to maintain continuity of personnel to avoid delays due to retraining of key personnel. Due to the scope of the effort, it is essential that it be supported at the highest levels and any objections be immediately resolved. Finally, channels of communication between the government and contractors must be established and maintained.

D. LSA Strategy.

Annex C contains the LSA Strategy to be used in the acquisition effort. Potential problems exist in coordinating the efforts of each subsystem/vehicle LSA Team with the overall AFV program. It is essential that each ILS/LSA manager throughout the AFV program be familiar with this plan and its annexes to avoid conflicts and duplication of efforts. Communication between proponent ILS/LSA offices should be established and

maintained throughout the program. LSA tasks during the present phase of the acquisition are a government responsibility. During subsequent phases of the program, all RFP's will be reviewed by the Materiel Readiness Support Activity (MRSA) for inclusion of LSA tasks in contract documents. The LSA/LSAR program will conform to the requirements of MIL-STD-1388-1A and 2A.

E. Supportability Test and Evaluation Concepts.

Present plans for testing and experimentation call for 85-100 prototypes to be tested. Final prototype requirements and allocations will be determined by the AFV Test Integration Working Group prior to release of the RFP for Development Proveout. Due to the accelerated acquisition schedule, concurrent testing will be conducted whenever possible. The LSA plan (Annex D) lists the organizations that provide inputs for the early LSA tasks which will provide objectives, goals and thresholds of the ILS program. A summary of the supportability test issues and objectives will be developed by the Logistics Center and provided to the TIWG for inclusion in the TEMP. Information developed will consider, at a minimum, the following:

1. Peculiar test requirements that are directly related to the ILS program (transportability, reliability, maintainability, supportability or contractual requirements related to supportability).

a. Actual or anticipated critical supportability issues and their impact on the support planning.

b. Testing and evaluation requirements necessary to assess actions taken to resolve critical issues.

c. Training, manpower and skills required to accomplish technical and user test (DT & UT) and evaluation.

d. Dates scheduled for initiation and completion of actions required to resolve supportability issues.

2. The interface between/update of LSAR's and the test data collection systems.

3. Test and evaluation of built-in or supporting automatic operating, testing and maintenance equipment (and associated software, if applicable).

4. How completed test results will affect planned test actions, criteria, requirements and so forth. A summary of TEMP significant actions and activities will be provided which includes;

a. Proposed test locations.

b. Data collection procedures and data uses.

c. Organizations and responsibilities involved in the test and evaluation efforts.

d. Requirements for preparation of a plan for logistic demonstration (LD) for verifying the LSAR, components of the system support package (SSP), TMDE, maintenance allocation chart, repair parts/special tool list in accordance with AR 700-127 and AR 70-1. The LD should be accomplished as soon as feasible after a representative engineering development prototype is available. LD must be completed in a timely manner so that components of the SSP, their source and availability are established to support appropriate TT and UT.

5. Identify the requirements and method to be used for providing a system prototype for LD (for example, dedicated or on a time-phased sequential claimant basis).

6. Adequate justification and documentation for corrective actions not taken prior to succeeding phases of program development. These will be included for any logistic supportability related deficiencies or shortcomings which have not been resolved or corrected.

7. The AFV SMMP will contain testing requirements/issues which are applicable to the six domains of MANPRINT. F. ILS Element Plans.

1. Design Influence.

ILS and LCC factors will influence source selection, vehicle/subsystem design and acquisition decisions. A 20% reduction in LCC is a key goal of the system design. In addition, a 40% reduction in operating and support costs has been established as a target for supportability savings. To emphasize the impact of system design on operating and support costs, contract incentive awards will be scheduled for early determination. Support characteristics will receive management emphasis on a par with performance requirements throughout the AFV program. As approximately 70% of LCC consists of maintainability elements, approximately 70% of the AFV incentive dollars will be linked either directly or indirectly to maintainability. Logistic engineers will be collocated with design engineers to facilitate direct communications and staff support to managers at government and contractor facilities supporting AFV development. The AFV will be designed with appropriate consideration for diagnostics, prognostics and maintainability at all maintenance levels. BIT/BITE and embedded training will be used where cost/operational advantages can be shown. Particular attention will be paid to accessibility of components requiring replacement in the field, especially at crew/unit level. Components will be designed to allow repair in the shortest feasible time by the lowest practicable skill levels while making maximum use of standard tools and test equipment. During Proof of Principle, subsystem/vehicle annexes will incorporate unique vehicle factors that will influence design such as:

a. Climatic, environmental and energy constraints and initiatives, hazardous materials and any related trade-offs.

b. ILS (to include logistics related reliability, manpower and training) constraints and proposed readiness/availability objectives.

c. Funding limitations.

d. Logistics related durability and survivability (to include corrosion protection, long term storage, nuclear, biological and chemical (NBC) resistance).

e. LSA, to include reliability centered maintenance (RCM). Logistic influence on design is accomplished through the early and cost effective application of the LSA process. Timely translation and incorporation of LSA Task results into requirement, decision and contractual documents will influence the conceptual design, the developmental design as it evolves, as well as design changes/improvements after fielding.

f. Proposed deployment and employment concept.

g. Applicability of experience with similar EI/WS or other lessons learned which might influence EI/WS design or support. DA ILS Lessons Learned repository (AMC Materiel Readiness Support Activity (MRSA), AMXMD-EI, Lexington, KY 40511-5011) will be used as a source of information.

h. Human factors (MANPRINT) constraints to assure that vehicle/subsystem designs will contain the fewest possible human factor problems in the areas of transport, operation, maintenance, calibration and so forth. This will include any safety requirements and health hazard assessments requirements, as applicable, to comply with AR 40-10. MANPRINT considerations will be equal to system design in the AFV source selection process. Simplicity of operation, ease of maintenance and support, and availability of operating skills are vital to the success of the AFV program. The AFV vehicles will be designed to be safe to operate and to provide a healthy environment. A System Safety Program Plan will be established IAW MIL-STD-882 to guide the system safety effort. MIL-STD-454, General Requirements for Electrical Equipment, will be followed for bonding, grounding, and lighting protection. Human engineering and noise limitations will be developed IAW the provisions of MIL-STD-1472C and MIL-STD-1474, respectively. Additional details concerning human factors engineering (HFE) will be contained in the AFV SMMP.

i. Component and major item Standardization and Interoperability (S&I) requirements.

j. Applicability of the Army Oil Analysis Program (AOAP), AR 750-1. Description will include specification considerations and required contractor and government analysis and study tasks.

k. Transportability requirements and constraints, to include impact on unit and force deployability.

l. Other support related design requirements and constraint (for example, facilities and POL).

2. Maintenance Plan.

The AFV will be supported by the maintenance structure in use by the Army during the 1995-2005 timeframe. Maintenance for the AFV will be principally based on a three level concept of support. Individual components may employ two level support or 'design-for-discard' features. Subsystem/vehicle annexes will identify maintenance tasks required to sustain each EI/WS at a defined level of readiness. The LSAR data record format may be used to provide contractors with maintenance planning data.

a. Alternative support concepts for the AFV will be considered and assimilated if proven cost and operationally effective. The following sub-paragraphs represent the best available estimate of how the Army will support an AFV fleet. This concept will change as the program matures. Subsystem/vehicle annexes will describe unique support plans resulting from logistic studies and applicable O&O plans. Proposed or actual skills, tools, TMDE, and support equipment will be defined, as the information becomes available, for each level of maintenance.

(1) The maintenance structure in the mid-1990's when the AFV is first fielded will consist of three maintenance levels: Unit Maintenance, Intermediate Maintenance, and Echelons Above Corps (EAC).

(2) Unit Personnel will be trained in PMCS and limited maintenance through replacement of components. Equipment will be designed for optimum simplicity, reliability, availability and maintainability. Diagnosis of maintenance needs will be enhanced through the use of embedded diagnostics/prognostics, BIT/BITE and ATE which will fault isolate to the level authorized for operator/crew/unit (organizational) repair. Manual trouble shooting of components and cable assemblies using external TMDE must be limited. When necessary, vehicles requiring external TMDE should be designed to utilize a common diagnostic connector. Unit maintenance will be characterized by quick turnaround repairs based on battlefield damage assessment and repair techniques and other expedient methods. As an initial goal, at unit level, ninety percent of required maintenance tasks will be repairable in 1 clock hour and will require no more than two man-hours to accomplish. Emphasis will be placed on development and use of expendable modules for this level in addition to provisions for module or LRU replacement as far forward as the breakdown site. The primary source of technical assistance to the operator/crew will be provided by the organizational maintenance personnel of the unit. Expertise will be developed during formal BNOCC and ANOCC training courses. Technical assistance beyond unit maintenance capabilities will be provided by the supporting IDS maintenance unit.

(3) Intermediate Maintenance elements will be organized and equipped to provide the greatest degree of combat essential maintenance forward, consistent with mission requirements. To meet the maintenance requirements of the future, intermediate maintenance elements will be configured into highly mobile maintenance support teams (MST's) with capabilities suited for delivering flexible support. These MST's will operate out of forward based companies, be tailored to the tactical situation and will have the capability to maneuver quickly on the battlefield. The Intermediate Maintenance company base will augment MST's and contain trained diagnosticians to provide the teams with technical expertise. MST's will fault diagnose, adjust, align and replace LRU's beyond the capabilities of supported units. Emphasis at this level will be to repair by replacement of defective modules and components and to repair selected LRU's through the use of Intermediate Forward Test Equipment (IFTE). As a goal, ninety percent of the maintenance tasks at intermediate (forward) level will be repairable in less than 8 clock hours. The capabilities of the intermediate units will be based on the types of major systems supported. Cannibalization and/or controlled substitution of damaged equipment will be focused at the unit maintenance collection point (UMCP). However, Intermediate Maintenance units serve as the re-entry point into the supply system for unserviceable, repairable materiel.

(4) EAC maintenance facilities may be located in either CONUS or OCONUS. These facilities will perform repair of equipment in support of the Theater/EAC supply system. Operations normally assigned to EAC maintenance facilities include: overhaul and repair of end items, components and modules; repair of materiel which exceeds the capacity and/or capability of the field support unit; unique inspections and modifications of equipment requiring extensive disassembly and specialized test equipment; repair an return of SRU's and LRU's to theater stocks; and fabrication or procurement of items and repair parts not otherwise available in the supply system.

b. Each vehicle within the AFV will be designed to allow for uniform towing and recovery by the AFV recovery subsystem. Additionally, all vehicles within the family will be configured to allow towing on secondary roads for up to four kilometers with no preparation. All members of the AFV will be capable of evacuation by the Heavy Equipment Transporter system.

c. As a result of LSA task accomplishment, strengths and weaknesses of each support alternative and their effect on EI/WS design, SRO, EI/WS acquisition and O&S costs, and ILS elements will be defined and recorded during the Proof of Principle Phase.

d. At this stage of the development, little is known about potential inter-service support, host nation support (HNS), ICS or CLS and contractor warranties. The AFV Program Planner will seek to negotiate a single, complete vehicle warranty for each vehicle for up to two years from purchase. Also considered will be economic and operational advantages to be gained through leasing of selected components.

e. **The AMC ILS manager will be responsible for development of a Depot Maintenance Study (DMS) and a Depot Maintenance Support Plan (DMSP) for the AFV. These documents will be included as Appendix G, when completed.**

f. **A depot maintenance interservice (DMI) study will be conducted by the Joint Depot Analysis Group (JDMAG). The AFV will be introduced for DMI study NLT 90 days after award of the Development Proveout contract.**

g. Maintenance Environment.

(1) The TRADOC Program Planner will utilize outputs from the LSA Use Study to determine the maintenance limitations, constraints and requirements (to include depot, active and reserve) projected for the deployment time frames. These plans will also provide sufficient detail concerning vehicle turnaround times, direct productive annual maintenance man-hours (DPAMMH), mean time between maintenance actions (MTBMA), mean time to repair (MTTR) and mean time between preventative maintenance resulting from LSA. LSA documentation will be used as the primary source of design related Logistic Support Data for the AFV.

(2) As it becomes available, vehicle annexes will also state the nature and extent of maintenance to be performed by each level of maintenance. Alternative approaches and trade-off criteria will be included, when applicable.

(3) During Proof of Principle, vehicle annexes will be updated to include the organizational and logistic support structure of each divisional and/or nondivisional unit that will be responsible for providing intermediate maintenance and supply support.

(4) **Special support requirements for the AFV will be defined prior to the Production/Deployment phase of the acquisition. Depots responsible for depot repair/overhaul of EI/WS components of the AFV will be identified and incorporated in the vehicle annexes and overall ILSP. Depot assignment for the AFV, including chassis, mission modules, integrated propulsion units, electronics, optics and other components will be determined by economic analysis during the Development Proveout Phase. HQ DESCOM will candidate CONUS and OCONUS Army depots to repair/overhaul AFV end items and components. If feasible, manufacture and repair of components will be assigned to an existing CONUS Army Depot and/or CONUS Intermediate Depot.**

h. Safety.

Efforts to minimize unique vehicle EI/WS safety problems during operations, maintenance, storage, transportation and disposal will be described in each vehicle annex. General safety provisions will be contained in the AFV SMMP.

i. Prepositioning of Materiel Configured to Unit Sets (POMCUS).

At present, POMCUS maintenance concepts, requirements and resources have not been developed. The Materiel Developer will ensure that these are provided as input to the ILSP prior to the Development Proveout phase of the acquisition.

3. Manpower and Personnel.

a. During the Requirements/Tech Base Activities phase, the maintenance manpower and personnel impact (including burden on the gaining commands) for each vehicle will be projected. These estimates will be further refined through LSA and MANPRINT efforts during each subsequent phase of the program. The TIWG will develop plans to provide manpower and personnel (number and skill level) to test proposed vehicles and components of the AFV. These plans will include limitations and constraints, EI/WS peculiar requirements and man machine interface (MANPRINT). Assessment of projected force structure (at time of deployment) to meet both peacetime and wartime needs will be performed by the Combined Arms Center with Logistic Center and Soldier Support Center support. Prior to 1st QTR FY 88, Combined Arms Center will produce a listing of potential Qualitative and Quantitative Personnel Requirements Information (QQPRI) and Manpower Requirements Criteria (MARC) information needs. MANPRINT will be included in the statement of work used in Proof of Principle, Development Proveout and Production/Deployment phase contracts.

b. Specific personnel and skills requirements for operators, crews, and maintenance personnel at each level will be developed and documented through the LSA process using LSA Data Record C, Task Analysis Summary; D and D1, Maintenance Task analysis; and G, Skill Evaluation and Justification. Manpower, personnel and skill requirements will subsequently be identified in LSAR output summaries LSA-001, Direct Annual Maintenance Man-hours (AMMH) by Skill Specialty and Category of Maintenance, and LSA-002, Personnel and Skill Summary. A structured MANPRINT program has been developed to plan the manpower, personnel and training aspects of the AFV. The SMMP will establish procedures to ensure that MANPRINT analytical work is recorded on the appropriate LSAR's to avoid duplication of effort. More detailed planning data will be developed during the Proof of Principle Phase. Products developed during this phase will include QQPRI, TOE/TDA changes, BOIP, safety release, health hazard assessment (IAW AR 40-10), and a Human Factors Engineering Analysis (IAW AR 620-1 and MIL-STD 1472C).

c. Vehicle annexes will describe unique skill requirements for personnel necessary to operate, maintain and support each vehicle. These annexes will consider the following:

(1) Present MOS and skills (AR 611-1 and 611-201) that may be used with little or no retraining.

(2) New skills required (LSAR G data record format). This may require extensive training or a new MOS and may require a design modification to the vehicle.

(3) Assigned duties.
(4) Task, skill, behavior and man machine interface (MANPRINT) analysis.

d. Manpower and personnel requirements and milestones will be coordinated through TRADOC by the office of the AFV ILS Program Planner during each phase of the program. The AFV MANPRINT Joint Working Group, TIWG and ILSMT will ensure that plans for which they are responsible include provisions for accomplishing this task during each phase of the acquisition cycle.

4. Supply Support.

The AFV will be supported by the standard Army supply support system. Currently, the AFV supply support concept calls for selected Class VII major assemblies, Class IX repair parts, modules and LRU's to be stored at the unit level for immediate replacement upon failure. Current prescribed load policies would remain substantially the same with the possible exception of the quantity and type of on-board spares to support increased operator/crew maintenance. Organic supply support will utilize the standard initial provisioning procedures to achieve the System Readiness Objective (SRO) goal. Remaining Class VII and IX repair parts will be stored at the support maintenance unit. Use of contractor supply support will be examined by the materiel developer. The Materiel Developer will also be responsible for preparing and updating the AFV Provisioning Plan (IAW AR 700-18). Supply support concepts for ASIOE will be the same as current. High reliability of components and test equipment, coupled with a heavy emphasis on the use of standard parts throughout the AFV will substantially reduce the burden on the supply system and enhance operational readiness. In addition, all subsystems of the AFV will be developed to accept hot refueling, to include refueling by the armored refuel subsystem, utilizing the Standard Army Refuel System (SARS) IAW AMC Pam XXX-XXX (TBP).

a. LSA tasks conducted during the Requirements/Tech Base Activities and Proof of Principle Phases of the program will identify the impact of any deviation from standard Army supply support procedures on readiness, cost and manpower.

b. The LSA Plan will contain provisions for identification of spare and repair parts data by maintenance level and consumption rates and will provide provisioning data. Source, Maintenance and Recoverability (SMR) coding will be accomplished during supply support analysis and verified at provisioning conferences. Planning for the provisioning of the system by the government and respective contractors has begun in the Requirements/Tech Base Activities phase and will continue throughout the acquisition cycle for the system. Provisioning requirements will be determined and documented through the LSA/LSAR process during the Development Proveout Phase. Provisioning requirements will be specified in LSAR format to competing contractors in the provisioning requirements statement (PRS) provided with the request for proposal for Development Proveout. The provisioning requirements will be reviewed and discussed with the selected contractor(s) at a provisioning guidance conference to be held at the contractor's facility within 30 days after contract award to ensure his full comprehension of those requirements. The provisioning plan will describe the procedures for cataloging, acquisition, packaging, preservation, receipt, storage, issue and disposal of:

(1) Repair parts, ammunition and POL.
(2) Secondary items.
(3) Special and common tools.

c. Planning for determination of maintenance float, operational readiness float (ORF) and repair cycle float (RCF) factors, and for war reserve materiel requirements will be accomplished by the materiel developer IAW AR 710-1. Plans will include procedures for reviewing and adjusting factors based on experience data. Initial factors will be determined prior to Production/Deployment.

d. The LSA Plan (Annex D) will contain provisions which ensure that the SSP component list is provided at least 60 days before testing begins. The SSP will be provided to the test site at least 30 days before start of testing. The SSP will be thoroughly tested and evaluated during EUT&E, IOT&E, FOT&E, logistics demonstration, first article testing and any subsequent tests with critical support issues. Preliminary logistics elements will be evaluated during EUT&E and IOT&E.

e. The contractor(s) awarded contracts for AFV will be required to develop provisioning technical documentation through the LSA process. The items to be provisioned will be initially identified on the LSAR input data record "D1" based on an analysis of maintenance tasks to be performed. An LSAR input data record "H" will then be prepared for each item identified on the "D1" record to provide a complete description of the item with appropriate supply management data for the item. These H records will be initiated in the second half of the Proof of Principle Phase and completed during the Development Proveout Phase. The contractor will be required to initially develop a long lead time items list (LLTIL) IAW data item description DI-V-7004. A long lead time item provisioning conference will be held to review the contractor's list and make final selection of long lead time items to be procured in advance of normal procurement for provisioning items.

f. The "conference team" method will be used to accomplish provisioning. Upon completion of provisioning technical documentation (PTD), and supplemental provisioning technical documentation (SPTD) by the contractor, a provisioning conference will be held at the contractor's facility to select and code the items to be provisioned. Although a joint effort, the government will have the final decision with respect to the selection and coding of provisioning items. Support items will be coded as to source, maintenance level, recoverability, demilitarization and essentiality. While the contractor makes the initial recommendation, the final determination is made by the government team at the provisioning conference. This coding will be reflected in the repair parts and special tools list (RPSTL).

g. To the maximum extent feasible, failed components will be returned to depot or discarded at failure. Power packs will be replaced as integrated propulsion units avoiding the need to split packs in the field. Modularity will be emphasized throughout the design process to minimize the skills required to maintain AFV vehicles at the using unit.

h. Mission essential stockage of spares and repair parts will be performed in accordance with current policies. Demand supported items will also be stocked although it is anticipated that the quantity of authorized lines in PLL's/ASL's will be reduced for the AFV.

i. At this time, no requirement to establish Interservice Support agreements (ISSA) or HNS agreements are foreseen for the AFV.

j. Once the government takes over configuration control, any design changes which affect the PTD data previously submitted will be reported by the contractor to the provisioning activity (NICP) using design change notices (DCN) in accordance with DI-V-7009. These DCN will be accompanied by applicable SPTD to permit updating the data bank and supporting files. Follow on procurements will in turn use the updated PTD and SPTD for provisioning planning.

k. Due to the accelerated nature of the AFV acquisition, it is critical that the LLTIL be submitted by the contractor and approved by the government as early in the program as possible. Procurement of these items will be made concurrently in advance of the production contract to ensure delivery in time to support the fielding of the system.

l. Procedures for requisitioning initial and follow on supply support will be prepared by the material developer during the proof of principle phase. Future revisions of the ILSP will include these plans accompanied by flow charts showing the process.

m. An assessment of the acquisition schedule on provisioning efforts will be made during each phase of the acquisition and included in this plan and vehicle annexes.

n. As part of the LSA/LSAR effort during the Proof of Principle phase, an analysis of the effect of provisioning and maintenance alternatives on the SRO will be performed. In addition, an LORA will be conducted.

o. Early submission of projected requirements to supply supporting organizations (Defense Logistics Agency (DLA), General Services Administration (GSA), and others) is needed to permit increased stockage of items supporting the AFV. Provisioning plans will ensure that timely coordination with these agencies is provided for.

p. Basic Sustainment Materiel (BSM) requirements for the AFV will be projected by the materiel developer in the Proof of Principle Phase and established in the Development Proveout phase. Requirements for initial fielding, annual unit consumption during peacetime (training) and wartime will be developed.

5. Support Equipment and Test, Measurement and Diagnostic Equipment.

a. During Proof of Principle and Development Proveout Phases, the contractor(s) will be required to investigate existing Standard Support Equipment in the Army inventory for use with the AFV. The TMDE Register (AR 750-43) and Preferred Items List (PIL) will be used for information in this investigation. Recommendations for changes in design based on this investigation will be forwarded to the program management office accompanied with suspense dates which must be met to assure changes are completed by required time of need. LSA results (during Proof of Principle) identifying supply support requirements will be analyzed to determine total AFV support equipment impacts. The AFV will be maintainable at all echelons of maintenance using its support equipment, common tools, SKO's and TMDE listed in the PIL and available in the Army inventory at the time of AFV Full Scale Engineering Development (FSED). Special tool requirements will be kept to an absolute minimum.

(1) The diagnostic design for the AFV must be an integral part of the system engineering process. To achieve the goal of integrated diagnostics, the materiel developer must provide a system engineering plan as required by MIL-STD 499. In addition, plans for ensuring supportability, reliability, maintainability and testability of the integrated diagnostics will be established IAW MIL-STD 1388, MIL-STD 785, MIL-STD 470 and MIL-STD 2165. Additionally the maintainability of the integrated diagnostics must be demonstrated IAW MIL-STD 471.

(2) The overall goal within the area of integrated diagnostics is to provide the AFV user a total diagnostic capability that will be developed concurrently with the weapon system. The total diagnostics package must be delivered to the user/maintainer concurrently with the equipment. This includes technical publications required for operation and training of operators and maintenance personnel. Embedded diagnostics will predominate at the unit level. Higher levels of maintenance will be supported by IFTE within the systems support package (SSP). The capability of BIT/BITE to fault isolate to the defective LRU will be augmented by the use of Contact Test Sets (CTS's) by the maintenance contact team.

(3) Under the concept of Microcircuit Technology in Logistics Applications (MITLA), an Automated Logbook System will provide the on-board information collection of Maintenance Management Information required IAW DA Pam 738-750. The Automated Logbook System expands the ability to collect logistics information and consists of on-board sensors/monitors which feed real time data to an equipment data tag. The data tag will interface with a host computer system (Unit Level Computer System (ULCS) and the Tactical Army CSS Computer System (TACSS) for rapid receipt and transmission of maintenance related information.

(4) BIT/BITE and prognostics will provide the crew with a continuous performance monitoring capability of the AFV. BIT, while in the continuous monitoring mode, will be capable of immediately informing the crew of an equipment failure. In the test mode, BITE and ATE will rapidly identify the defective LRU at unit level and SRU at higher levels, as required. On board spares will be provided for LRU's that are identified as high probability failure components. LRU's and SRU's may consist of electronic, optic, hydraulic or mechanical modules, assemblies or components. The vehicle design will facilitate operator/crew repair through replacement using on board spares. LRU's will be designed to be repairable by replacement of SRU's at the intermediate maintenance level. SRU's will incorporate design for testability, to include internal BIT indicators whenever practicable. PCB's will incorporate design for automated screening in the Base Shop Test Facility (BSTF).

(5) IFTE will consist of a BSTF, CTS, Electro-Optic Test Facility (EOTF) and Electro-Optic Contact Test Set (EOCTS). BSTF/EOTF will provide the AFV with in-depth diagnostic capabilities for screening LRU's, SRU's and PCB's. The BSTF/EOTF will each be computerized diagnostic test facilities capable of interrogating any electronic component for which a TPS has been provided by the materiel developer. At maintenance levels below depot and above unit, IFTE will be used. Instead of IFTE, depots will use commercial equivalent equipment (CEE). Consequently, AFV must incorporate a digital architecture to be compatible with IFTE. IFTE will provide the means to test AFV components mounted or removed from the vehicle. The materiel developer must

concurrently develop Test Program Sets (TPS's) to ensure testability of the AFV by IFTE. For on-site maintenance, contact teams will use CTS/EOCTS which will interface with the tested vehicle via standard diagnostic connector assemblies (DCA's), allowing diagnosis in the fully assembled vehicle configuration. The CTS/EOCTS will use test/diagnostic software which is compatible with BSTF/EOTF to allow test compatibility at all levels of maintenance.

b. The LSA plan will include procedures for establishing TMDE requirements in a timely manner. As part of the development of TMDE requirements, analysis of acquisition schedules for projected equipment will take place to ensure that any necessary equipment is available when needed. For the AFV, BIT/BITE will be a priority effort. When external test equipment is needed, general purpose equipment will be used wherever possible. As a last resort, special purpose test equipment will be used if general purpose equipment will not support the equipment. The AFV LSA Plan will provide measures which assure that the use of special purpose TMDE is minimized to the greatest possible extent. Consideration for contractor incentive awards for reductions in special purpose TMDE will be incorporated into contracts during Proof of Principle and Development Proveout Phases. Requirements for interfacing devices exist to allow for the interconnection of IFTE to the component under test.

c. Specific support equipment requirements will be determined through the LSA process using LSAR input Data Records C, Task Analysis Summary; D, Maintenance and Operator Task Analysis; E and E1, Support and Test Equipment or Training Material Description and Justification; H and H1, Supply Support Requirements. Support equipment summaries will be identified in LSAR output summaries LSA-005, Support Item Utilization Summary; LSA-007 and LSA-008, Support Item Requirements; LSA-009 and LSA-010, Support Items List; and LSA-013, Support Equipment Grouping Utilization Summary. At a minimum, ninety percent of all malfunctions resulting in operational failure/mission abort will be capable of detection and repair at unit level.

d. The Project Manager will ensure that major items of support related hardware are identified prior to the third year of the Production/Deployment Phase. Special emphasis will be placed on identifying requirements for scarce support resources.

e. The LSA Plan will describe procedures for maximizing selection of standard tools and support equipment to support the AFV. This plan will include provisions for ASIOE, to include vehicles, generators and trailers. These procedures will be included in vehicle annexes and will be completed prior to the end of Proof of Principle.

f. Requirements for TMDE registration and acquisition approval will be prepared by the Program Planner materiel developer prior to the completion of Proof of Principle, in accordance with AR 750-43. Contracts during each phase of development will include instructions regarding the use of common TMDE, including requirements for calibration and calibration support.

g. Calibration requirements for the AFV will be developed during the Development Proveout Phase and incorporated into this plan and vehicle annexes.

h. During the Development Proveout Phase, the Program Planner will identify support equipment and TMDE peculiar hardware development, quantity, acquisition and support requirements. Any

environmental and storage requirements for TMDE, automatic test equipment (ATE), and test program sets (TPS) will also be identified and actions initiated to ensure that they are available to support the system upon fielding.

i. As part of LSA/LSAR, support equipment and TMDE peculiar test and evaluation objectives will be established and provided as input, when appropriate, to the TEMP and Detailed Test Plan (DTP). This information will be developed during the Proof of Principle Phase.

j. Requirements for local fabrication of tools/maintenance test stands or any other support items will be identified during Development Proveout and provided to the user and supporting depots as soon as possible.

k. Software changes to maintenance equipment and interconnecting devices required to test AFV systems on existing test stands will be identified during Development Proveout. Necessary actions to ensure equipment supportability once fielded will be initiated as soon as possible.

6. Training and Training Devices.

a. General.

(1) The objective of the AFV training program is to enhance existing skills with knowledge of the system and any special techniques applicable to the operation and maintenance of the system. It is not anticipated that any new military occupational specialties (MOS's) peculiar to the AFV will be required. However, the extensive electronic and mechanical automation will require significant training changes at both institutional and unit levels.

(2) All individual and collective training requirements for each MOS associated with this system will be contained in the individual and collective training plan (ICTP). An outline individual and collective training plan (OICTP) will be developed during the Proof of Principle phase. This document will contain preliminary information on the training and training support requirements. The OICTP will be updated throughout the Proof of Principle phase to reflect the training concept and strategy for all MOS's affected (both active and reserve). It will be converted to the ICTP during Development Proveout Phase when requirements can be more defined.

(3) A TSWG has been established to coordinate the training program and assist in the development of the new equipment training plan (NETP) for the system. Vehicle proponents, with support as required from PM TRADE will integrate the training devices requirements for the AFV through the TRADOC ILS Program Planner. PM TRADE will provide the TDCFP in sufficient time and detail to allow the materiel developer to develop and demonstrate the prototype training devices, support the trade-off analysis of logistics support concepts, and perform the total system LCC analysis.

(4) Tentative training device requirements will be established in the O&O plan. The required operational capability (ROC) will identify specific requirements for the development and procurement of training devices, both external and embedded, and the basis of issue plan (BOIP) will identify quantities and distribution of these training devices.

(5) AMC, in coordination with TRADOC, will develop a common training analysis base capable of providing a complete transfer of knowledge from AMC to the gaining commands (both active and reserve). This common training base will be developed through the logistic support analysis (LSA) process. This common training analysis base will be completed by AMC in sufficient time to allow all training products to be developed and evaluated during operational tests. The common training analysis base will be incorporated into this ILSP when completed.

(6) Specific training device and training materiel requirements will be identified through the LSA process using LSAR input Data Sheets E and E1, Support and Test Equipment or Training Material Description and Justification. Training device requirements will subsequently be identified in LSAR output summary LSA-11, Special Training Device Requirements.

b. At this time, no additional long term training facilities are expected to be required to support the AFV. Throughout the program, Chief of Engineers, DA, will be involved with review of plans and requirements documents to verify that no additional requirements are created. Due to the shortened acquisition cycle, it is critical that any additional facilities, if needed for either active or reserve components, are accurately forecast early in the program.

c. New Equipment Training.

(1) The AFV management organization will maintain overall program responsibility for NET in coordination with AMC and TRADOC; however, the proponent AMC readiness commands will assist in conducting NET, as required. HQ TRADOC has the responsibility to coordinate training support for the system with TRADOC schools involved in the NET program.

(2) The system contractor(s) will be required to provide initial training (transfer of knowledge) to Government personnel. The contractor(s) will develop and deliver a Training Plan (TP) and Training Support Packages (TSP's) which will become the foundation for introducing AFV into the Army Training Program (IAW MIL-STD 1379B). NET courses will be provided to staff planners and technical specialists responsible for interim planning for introduction of this system into the Army inventory. NET will also be provided to technical and user test personnel.

(3) During the materiel fielding effort, NET teams (NETT) will be organized to provide NET to the user at selected training sites. The location and strategy for NET may vary upon the particular circumstances associated with each deployment and between active and reserve units. USACAC will assist NET teams in assembling unit training packages to include training aids, lesson plans and self paced modules.

(4) The NETT will arrive at the training sites concurrently with the delivery of the training base shipment, normally 2-3 months prior to the start of transition training of the first using unit. The NETT's will train key personnel and instructors of the gaining command in the operation and maintenance of the system. Depending on the circumstances at the time, NET of intermediate maintenance personnel may be conducted at central locations other than those used for crew training. NET will also be provided to depot maintenance personnel in CONUS and OCONUS theaters.

(5) A new equipment training plan (NETP) will be prepared during the Development Prove-Out Phase once the program has become more defined and specific NET planning can be performed. The NETP will be developed for Milestone I/II decision and will become a part of this plan, when available.

d. Institutional Training.

(1) Resident training of operator and maintenance support personnel at TRADOC schools will include the AFV in their curriculum for all applicable MOS's prior to first delivery to the field. Crew members will receive both operational and maintenance training as part of their program of instruction. This training will exceed current preventative maintenance checks and services (PMCS) and will allow them to perform certain additional maintenance tasks within their skill level.

(2) Training for the AFV is expected to make extensive use of embedded training, simulators and training devices. Primary among these may be a programmable training simulator which would allow for training of the crew in degraded operational modes and in troubleshooting and fault isolation. Training will be conducted in both garrison and field environments in collective, crew and individual modes. Provisions for reserve component units and training devices for training EOD and ammunition personnel must also be developed.

(3) It is expected that intermediate maintenance personnel will require additional training to qualify them on this system.

e. Nonstandard or transportation/storage training requirements for movement and storage of sensitive/classified EI/WS components, ammunition, TPS's, etcetera, have not been identified. These requirements will be developed during the Proof of Principle phase of the acquisition.

7. Technical Data.

a. The AFV will be supported by DA publications. Technical Data will be developed by the Computer Aided Logistic Support (CALS) system utilizing the Militarized Electronic Information System (MEIDS) for technical documentation. Operator's manuals and unit level maintenance manuals will cover the end item/weapon system as a unit, avoiding the situation wherein one TM covers the basic or common portion of the vehicle and a second TM covers the end-item-specific hardware. Depot maintenance work requirements (DMWR) will be prepared to support depot level overhaul of the system and its major subsystems and components. Emphasis will be placed on the completion of those portions of the DMWR required to support initial fielding; i.e., components which may fail during the early deployment phase and require depot maintenance to ensure early return to the user, thereby reducing the requirement for additional spares.

b. Preliminary draft equipment publications (PDEP) will be made available for evaluation during IOT&E (3rd QTR FY91). They will then be updated in sufficient time to support the logistic demonstration (3rd QTR FY 92). Draft equipment publications (DEP), further updated as a result of the LD, will be available to support FOT&E and will be fully evaluated during those tests. A formal publications verification will be conducted by the Government using soldier personnel of the appropriate grade level during the Production/Deployment Phase. Operator, unit maintenance and intermediate maintenance manuals will be prepared as prescribed in MIL-M-63036 and MIL-M-63038. The detailed sequential task description necessary for the development of technical publications and

personnel requirements will be documented as prescribed in MIL-STD-1388-2A.

c. As LSA data is expanded and refined, the operations, maintenance, supply and design requirements developed will serve as the data base for the publishing of accurate technical publications. Use of this data will help to eliminate inaccuracy and duplication in all areas and greatly assist configuration management. New publications will be developed from the LSAR data base to ensure compatibility between repair parts lists, support equipment and tools lists, task allocation, skills and operating and maintenance instructions. An evaluation of the maintenance philosophy will be a prime driver in the selection and preparation of publications. Maintenance tasks prescribed in the unit and intermediate maintenance manuals will be developed through the LSA process using LSAR input Data Records A, Operations and Maintenance Requirements; B, Item reliability and Maintainability Characteristics; C, Task Analysis Summary; D and D1, Maintenance Task Analysis. These tasks will be subsequently identified in LSAR output summaries LSA-004, Maintenance Allocation Summary, and LSA-006, Critical Maintenance Task Summary. The RCM analysis logic provided in AMC Pam 750-16 will be used to determine the frequency for those maintenance tasks.

d. Repair parts and special tool lists (RPSTL) for unit and intermediate maintenance manuals will be developed through the LSA process using LSAR input Data Sheets E and EI, Support and Test Equipment or Training Material Description and Justification, and H and H1, Supply Support Requirements. Repair parts and special tool lists will subsequently be identified in LSAR output summaries (LSA-026, Repair Parts List; LSA-027, Special Tools List, and LSA-028, Cross Reference Indexes. Upon input of TM designations in the LSAR data base, initial RPSTL's will be prepared from LSAR summaries LSA-029, Repair Parts List; LSA-030, Special Tools List; and LSA-031, Cross Reference Indexes.

e. Actions, events, milestones and schedule for preparation and printing of final publications will be prepared during the Proof of Principle phase. Maintenance and operational records prescribed by DA Pam 738-750 will be evaluated for application to the AFV. Those designated will be identified to the DA Pam 738-750 responsible activity (LOGC ATTN: ATCL-SSM) at least 6 months before fielding for inclusion in Appendix E of DA Pam 738-750.

f. Draft equipment publications will be updated to incorporate changes which occur during LD, EUT&E, IOT&E AND FOT&E. Updates and finalized publication dates will be scheduled to ensure timely availability prior to first unit equipped (FUE).

g. At present, no requirement exists to plan for interservice coordination on technical data requirements. Vehicle annexes will incorporate this planning if a requirement exists at the vehicle level.

h. Requirements for specifications and drawings (TDP) to support DEP, LSA and the provisioning effort will be prepared by the materiel developer during the Proof of Principle Phase.

i. The LSA Plan will prescribe analysis which will determine if a technical data package (TDP) will be purchased and the amount of data needed (no data, level 1 drawings, level 3 drawings for organizational maintenance/training, etcetera). This analysis will include investigation into the effects of the technical data package on the acquisition strategy and the acquisition plan. This will be completed prior to Development Proveout.

8. Computer Resources Support.

a. The AFV is projected to have on board computers associated with its fire control, C^3, and propulsion systems. Software requirements to support these items will be identified after selection of alternative(s) for Proof of Principle. Software packages developed for AFV will be a contract deliverable item during Development Proveout. High priority will be given to the concurrent development and verification of test program sets (TPS) for the proper diagnosis of malfunction of components on available automatic test equipment (ATE). Funding for this effort will be included in the Tech Base program to support the system. Computer hardware and software will be treated as configuration items (CI) and as integral parts of the system. Acquisition of embedded computer resources (ECR) will be managed within the context of the total program. The AFV Computer Resources Management Plan (CRMP), will be prepared during the Proof of Principle phase. The CRMP will identify computer resource requirements for the EI/WS's of the AFV. This plan will include the following information:

(1) Determination of computer resource requirements for operation and maintenance of the EI/WS or any of its components within the boundary of the battlefield (Army battlefield automated systems), to include Life Cycle Software Support.

(2) Historical data review to assess suitability of existing computer resources.

(3) Comparison of existing computer resources to requirements stated in the requirements documentation, EI/WS specifications, etcetera.

(4) Determination of computer resource limitations.

b. Computer software support requirements will be identified by the material developer and provided as inputs to the LSA/LSAR documentation throughout the acquisition.

c. When completed, the CRMP will be included as Annex H to this ILSP.

d. Manpower and personnel requirements for developing and fielding computer resources and the training requirements to operate and maintain the computer resources in the active and reserve forces will be coordinated by the AFV MANPRINT Joint Working Group and included in LSA/LSAR documents.

e. The acquisition, testing and evaluation of computer software and software support will be performed in accordance with guidance contained in the CRMP. This document will also include plan for detecting and correcting software errors.

9. Packaging, Handling and Storage (PHS).

PHS will be planned and executed IAW MIL-STD-1367. This effort will include special consideration of special equipment, reusable containers, preservation materials and other items needed to assure adequate protection of items during shipment, handling and storage. PHS requirements will be considered in system design and trade off studies will be conducted to provide a reasonable balance between PHS costs and system performance.

a. Existing PHS equipment and procedures will be evaluated to determine their applicability to this system. This effort will be coordinated with AMC packaging, storage and containerization centers. Any unique PHS requirements, especially involving unique handling equipment, will be promptly identified to assure appropriate action for response to those requirements. The test and evaluation of the PHS element will address critical issues and objectives of PHS as set forth in the requirements documents.

b. Each contractor in the 1st QTR FY92 will be required to prepare a PHS plan to identify the approach to the development of procedures to properly package, handle and secure items for worldwide movement and storage. The shipping, handling and storage environment to which items will be exposed will be determined by engineering analysis. This information will be used to identify specific packaging requirements for the system. Packaging design will be accomplished IAW MIL-P-116 and MIL-STD-14232. The contractor will be required to explore the latest techniques and materials for use in container design. Consideration will be given to long term value and reusable features. Items designated as candidates for the special containers will be selected during the Proof of Principle phase.

c. Anticipated natural and induced storage environments, storage modes and constraint, and unique storage requirements will be identified late in the Proof of Principle phase. These requirements will be considered in design as part of the PHS concept. Existing storage facilities will be evaluated to determine their adequacy.

d. The LSA process will be used to develop basic PHS criteria for use in considering containerization, fragility and handling constraints, degree of reusability of containers, storage space requirements, and environmental constraints. LSAR input data sheets H will provide PHS data and information on components including dimensions and weights, whether with or without packing, unit pack quantity, security classification, pilferage category and special handling requirements.

e. Materials handling equipment requirements, including loading requirements will be investigated during the Proof of Principle phase. Existing loading and handling equipment (slings, forklifts, hoisting equipment, etcetera) and procedures will be evaluated in coordination with MTMC to determine their applicability to the system. Lifting, tie down and sling requirements will be specified IAW MIL-STD-209. The system will require special handling equipment on several vehicles and possible at the brigade support area, ammunition transfer points and/or ammunition supply points. The type of equipment selected will be dependent upon the alternative system selected and the operational concept. These requirements will be established after selection of alternatives for Development Proveout.

f. The LSA/LSAR process will be used to provide the following information prior to Milestone I/II (during Proof of Principle):

(1) Trade-offs of PHS requirements.

(2) Trade-offs of PHS risk areas affecting LCC.

g. PHS assets required and expected to be available at FUE will be determined prior to initiation of the Development Proveout phase.

h. The TIWG will ensure that PHS requirements have been identified and included in the TEMP as soon as possible.

i. As the information becomes available, vehicle annexes will list supply bulletin number(s) of the storage serviceability standard (SSS) that is appropriate for the EI/WS. If no SSS is required, that will be stated.

10. Transportation and Transportability (T&T).

a. Transportability requirements will be considered in the design of the AFV IAW AR 70-47, MIL-STD-1366, MIL-HDBK-157, MIL-STD-209 and MIL-STD-810. Transportability will be one of the factors to be included in trade-off analyses with respect to mode (air versus surface) and with other design factors (operational requirements, RAM, life cycle costs, etcetera). Transportability design criteria and constraints will be identified through the LSA process, using LSAR input data sheet J, Transportability Engineering Characteristics. During Proof of Principle, T&T responsibilities, requirements and constraints, including those related to unit and force deployability, will be determined. Required strategic and tactical transport modes and aircraft and vehicle types will be identified in vehicle O&O Plan annexes. User transportability limitations, including container compatibility, will be developed during Proof of Principle. During this phase, design or performance trade-offs for mobility, transportability, and rapid deployment will be determined to include transportation requirements for ASIOE, TMDE, parts and BSM.

b. During the Requirements/Tech Base Activities Phase, coordination with MTMC will be made to determine requirements for development of a transportability request to be submitted to Commander, Military Traffic Management Command (MTMC), ATTN: MT-SA, WASH DC 20315 for approval. When completed and approved, this request will be included as Appendix I to the ILSP.

c. During Proof of Principle, actions necessary to resolve T&T problems will be identified, to include:

(1) Trade-off of T&T requirements.

(2) Trade-offs of T&T risk areas affecting LCC.

d. Logistic analysis conducted during the Proof of Principle Phase will describe current T&T assets, those expected to be available at FUE, and will be used to identify and resolve T&T issues.

e. Current and projected changes to T&T systems and procedures will also be identified during the Proof of Principle Phase. A determination will be made concerning the interface with T&T equipment undergoing parallel development and/or testing.

f. The TIWG will ensure that coordination is made to include T&T requirements in the TEMP.

g. A decision to produce a Transportability Guidance technical manual for the AFV will be made during the Proof of Principle Phase and recorded in future ILSP's. Responsibility for this document will belong to MTMC.

h. Any AFV subsystems which are acquired for multiservice use require the following information:

(1) T&T requirements for shipment of equipment to CONUS and overseas commands, including special T&T requirements of participating services.

(2) Loading and unloading configuration layout by appropriate aircraft type when air transportation is to be used. Weight and cube data will also be included.

i. The AFV will be designed to minimize special care requirements during transportation (for example, removal of sensitive components, special transportation and transportability during during repair and movement). These requirements will be monitored throughout the program development and included in future ILSP's as required.

j. Lifting/tie-down requirements and procedures will be developed during Proof of Principle IAW MIL-STD 209. Procedures will be developed which ensure these are included in the final EI/WS configuration.

11. Facilities.

a. The AFV Program Planner will identify all fixed, semi-fixed and mobile facilities that may be required to support the system, including real estate, ranges, hard stands, buildings, utilities, capital equipment, vans, etcetera. Types of facilities to be identified include operations, test and evaluation, training (to include NET), storage (to include ammunition and ammunition propulsion, subsystem/vehicle, POL and repair parts), transition and permanent motor parks, maintenance and calibration, troop quarters, troop support, and family housing. Adequacy and availability of existing CONUS and OCONUS facilities to support the system, including reserve component, contractor and host nation facilities, will be evaluated during Proof of Principle.

b. Future ILSP's will provide for the following:

(1) A trade-off determination which will provide input to the decision to modify existing facilities or change the WS/EI design.

(2) New facility requirements (a last resort). Requirements will consider facilities needed for personnel using, testing, training, operating and performing field and depot maintenance operations.

(3) Responsibilities and funding for construction of modified or new facilities and any Military Construction, Army (MCA) and Military Construction, Army Reserve requirements. Additionally, schedules which assure facilities are available when needed will be provided.

(4) Special security requirements for storage and use of classified EI/WS, components, manuals, TB's, etcetera will be identified. Quantity and volume of material, security level of material and any electronic countermeasure (ECM) or TEMPEST characteristics will be noted.

c. Early involvement of HQDA (DAEN-ECE-T and DAEN-ZCI) WASH DC 20310 for development of a support facilities annex is critical due to the accelerated acquisition schedule. Major gaining commands will be advised of projected new and modified facilities requirements following identification of the facilities programming and scheduling of required actions.

d. A description of how the United States and host nation facilities requirements will be provided will be included in future documentation.

12. Standardization and Interoperability.

a. S&I opportunities will be emphasized during the Proof of Principle phase of the acquisition and included in the Rationalization, Standardization and Interoperability Plan (RSIP). This document will be prepared in accordance with AR 34-1, AR 34-2, AR 70-1, AR 71-9, and Public Law 99-145 and included as Appendix J.

(1) S&I considerations for logistics support planning will be evaluated during requirements preparation to influence design and prevent logistic problems with NATO and other countries that may deploy this weapon system. S&I requirements will be incorporated into vehicle/subsystem ROC's prior to Milestone I/II. S&I considerations will be updated as more information becomes available.

(2) In order to maintain the tight control of technology and still have the participation of foreign countries, the S&I government-to-government approach will provide for controlled data exchange, incorporation of ratified/implemented International Standardization Agreements (STANAG's) and Quadripartite Standardization Agreements (QSTAG's) into the equipment design and sale of the system through the Foreign Military Sales (FMS) and Direct Military Sales programs. The foreign sales programs will provide for recoupment of research, development and engineering costs from foreign countries through pricing of materiel without the imposition of direct participation and multinational control of hardware configuration. The transfer of technology and protection of data rights can be controlled and still permit the involvement of country representatives in the form of liaison or special project officers. A Standing Operating Procedure will be prepared by the Program Planner in anticipation of foreign country involvement during Proof of Principle. The SOP will be reviewed and approved by the Security Assistance Directorate. Personnel from the Materiel developer and associated Army agencies will be provided copies of the SOP and briefed semiannually on the policy for control of foreign nationals. The development contract will contain requirements to analyze and identify opportunities for cooperative programs.

b. The RSIP will include a list of essential items and equipment with which the AFV must operate. This will include any proposed or current EI/WS currently being planned or utilized by allied nations or EI/WS planned or used by the Army or other services.

c. Known or suspected S&I deficiencies and shortcomings and plans to correct them will be developed during the Proof of Principle phase. Development of the AFV to the standard metric system will be a key initiative.

d. By its nature, the AFV will consist of numerous components, devices and subsystems which will provide an S&I capability to reduce acquisition, training, operation, maintenance and supply costs. As the development effort is done, significant examples will be included in the ILSP.

G. Support Transition Planning.

During the Proof of Principle Phase a plan will be developed to determine how transition to government support will be accomplished. This plan will show how repair parts usage, skills, training, procedures,

technical data, etcetera will be obtained and used. Additionally, transition lessons learned will be used in the development of this plan as they apply to the program. The plan will contain sufficient detail to assure that all necessary data is provided in time to adequately provision, sustain and maintain the system prior to transition to Government support.

H. Support Resource Funds.

1. Estimated ILS planning costs by life cycle phase, including cost estimates for coordination meetings, will be determined and included in the ILSP as soon as possible. Any information sensitive for procurement, security or any other viewpoint will be indicated with information where the data may be obtained.

2. Studies and investigations to establish baseline cost estimate data will be scheduled and conducted during the Proof of Principal Phase. These will be used to determine by ILS element, total life cycle cost estimates. Scope and depth of the studies to be conducted will be included.

3. Support models and modifications used in cost estimating will be identified as appropriate. Limitations and assumptions made in the models will be recorded in the ILSP.

4. ILS and ILS planning efforts will be level 2 in the work breakdown structure (WBS). Cost performance reporting will be at the ILS task level, which is at level 3 in the contractor work breakdown structure (CWBS). The CWBS will be structured in the same format and structure as the ILS funding structure outlined in MIL-STD-881. The ILS WBS covers the management, design integration, and acquisition of support elements and will be used to: separately price each ILS-related line item specified by a separate statement of work (SOW), data item description (DID), and WBS element in contracts; assure visibility of ILS funds in the total program management control system reporting process; and assure control of ILS costs and schedules in the program evaluation and review techniques (PERT).

5. ILS cost estimating and accounting procedures will be performed in accordance with MIL-STD-881. These procedures will be used to assure that costing data can be translated to the overall EI/WS and WBS reporting.

6. Coordination channels and reporting schedules will be provided as they become available.

7. When completed, results will be included in the ILSP showing costs estimates by ILS element, major function and appropriation. Total requirements by POM years will be stated.

8. Estimated funding impacts on major subordinate commands will be made during Proof of Principle. Affected commands will be notified of current status to prepare for the impact any changes may cause.

I. Post Fielding Assessments.

1. During Development Proveout a schedule for post fielding ILS assessments will be completed. This will include the planned units for assessment and the status of support arrangements these units will provide to assessment teams. A description and list of assessment team personnel required will also be prepared.

2. Sample data collection (SDC) will be conducted in accordance with AR 750-37 and AR 702-3. The SDC plan will be addressed in the AFV transition plan. This plan will provide for validation of initial logistics support provided to the user units and provide the data for adjusting initial support resources provided. Planning for SDC will begin prior to Milestone III. The draft and finalized SDC plan will be included as an annex to the Materiel Fielding Plan (MFP). Use of the Materiel Fielding Team and other official representatives in support of the SDC program will be discussed in the MFP.

a. After initial materiel fielding, ILS management efforts will be directed toward improving the readiness, sustainability and overall life cycle cost of the AFV. Post-fielding efforts will include analyzing and assessing field data and feedback related to AFV and its support equipment performance. Consideration will be given to ILS aspects of product improvement programs (PIP's) and modification work orders (MWO's). The LSA documentation will be updated to reflect design changes (for example, PIP's or MWO's) or when operational or support concepts are altered. A formal ILS assessment will be conducted as part of the System Operational Readiness Review (SORR) conducted by TRADOC/AMC. This will provide a detailed review of overall performance and supportability of the AFV in an operational environment. The post fielding assessment will be conducted 12 to 24 months after IOC.

b. Gaining MACOM's will provide an assessment of strengths and weaknesses of the manpower, training and logistic support provided, in addition to a broad assessment of the overall performance of the AFV.

c. RAM Sample Data Collection (SDC) IAW AR 750-37 will be utilized for post-fielding ILS assessment. RAM SDC planning will begin prior to Milestone III and will be included in the Materiel Fielding Plan.

J. Post Production Support.

Plans for post production support will be developed during the Development Proveout Phase to collect data required be DA Pam 700-55, 21 Aug 86, App E. These plans will include the strategy for continued identification of requirements, acquisition strategies and milestone reviews. In this manner, readiness objectives can be met and sustained.

III. ILS MILESTONE SCHEDULE.

A. ILS Milestone Schedule.

ILS program tasks and events for the AFV are provided in Table 1.

B. Milestone Dates.

As the program progresses, Table 1 will be updated to reflect beginning, currently scheduled and completion dates of significant actions. It will also include command and staff elements with primary responsibility (and POC's) for the actions.

C. Coordination.

Coordination for each task in the Milestone Schedule will be accomplished by the agency representing the responsible organization on the ILSMT.

D. Sources.

Data used in the Milestone Schedule will be derived from the Army Management Milestone System (AMMS).

E. Reporting Responsibility.

MRSA will initiate and maintain the AFV milestone data in the CAMMS data base. Participating and supporting organizations are responsible for informing MRSA of any changes to their milestones or actions which will affect other milestones.

F. Assessment.

During Proof of Principle, procedures will be established to ensure that the effect of schedule changes on functional areas will be readily apparent. This will permit immediate action to asses the situation and start corrective actions.

TABLE 1. ILS MILESTONE SCHEDULE

DESCRIPTION	DATE	PROPONENT
O&O PLAN APPROVED	10/29/85	COMBAT DEVELOPER
JMSNS APPROVED	8/14/86	HQDA
ILSMT/LSA REVIEW TEAM ESTABLISHED	10/15/86	AFVTF
LSA/LSAR GUIDANCE CONFERENCE HELD	11/15/86	USA LOG CENTER
TEST INTEGRATION WORKING GROUP FORMED	11/15/86	AFVTF
INITIAL ILS PLAN AVAILABLE	6/ 6/87	AFVTF
CONCEPT FORMULATION PACKAGE COMPLETE	9/10/87	MATERIEL DEVELOPER
TRANSPORTABILITY RPT SUBMITTED TO MTMC	12/ 6/88	MATERIEL DEVELOPER
SYSTEM CONCEPT PAPER PREPARED	3/17/89	MATERIEL DEVELOPER
UNIQUE TRNG FACILITY RQMTS IDENT	4/16/89	TRAINER
INITIAL PRODUCTION READINESS REVIEW	4/24/89	MATERIEL DEVELOPER
DCSLOG ILS REVIEW I	6/ 1/89	HQDA
QUALITY ENGR PLANNING LIST DEVELOPMENT	6/ 1/89	MATERIEL DEVELOPER
MILESTONE DECISION REVIEW I/II	8/15/89	MATERIEL DEVELOPER
DEVELOPMENT PROVEOUT SD RELEASED	9/ 4/89	MATERIEL DEVELOPER
ASSIGN ZLIN	9/14/89	MATERIEL DEVELOPER
BOIPFD/QQPRI/DI SUBMITTED TO EARA	11/13/89	MATERIEL DEVELOPER
FSD CONTRACT AWARDED	11/13/89	MATERIEL DEVELOPER
BOIPFD/QQPRI/DI TO TRADOC	11/23/89	EARA
INTRO FOR DEPOT MAINT INT ANALYSIS	2/11/89	MATERIEL DEVELOPER
DEPOT MAINT CANDIDATES IDENTIFIED	2/11/89	MATERIEL DEVELOPER
UNIQUE FACILITY REQMTS IDENTIFIED	4/13/90	MATERIEL DEVELOPER

EUT&E SSP COMPONENT LIST SUBMITTED	5/ 7/90	MATERIEL DEVELOPER
REQUIREMENTS DOC/BOIP/QQPRI TO HQDA	5/22/90	MATERIEL DEVELOPER
EARLY USER TEST AND EXPERIMENTATION STARTED	6/ 6/90	COMBAT DEVELOPER
REQUIREMENTS DOC/BOIP/QQPRI APPROVED	6/21/90	HQDA
STAFF PLANNERS COURSE STARTED	7/11/90	MATERIEL DEVELOPER
IOT&E SSP COMPONENT LIST SUBMITTED	9/13/90	MATERIEL DEVELOPER
NET FOR TEST PERSONNEL COMPLETED	10/16/90	MATERIEL DEVELOPER
FAILURE DEF SCORING CRITERIA ESTBLSHD	11/ 3/90	MATERIEL DEVELOPER
INITIAL OPERATIONAL TEST AND EVALUATION STARTED	11/11/90	MATERIEL DEVELOPER
FACILITY SUPPORT ANNEX APPROVED	12/16/90	HQDA
CONTRACTOR LOGISTIC SUPPORT DECISION	12/19/90	MATERIEL DEVELOPER
TECH DATA FOR DMI REVIEW	2/16/91	MATERIEL DEVELOPER
DRAFT TPSMP AVAILABLE	2/16/91	MATERIEL DEVELOPER
USAREUR FACILITY REQMTS PROGRAMED	2/17/91	MATERIEL DEVELOPER
ID OF CONTRACTOR TECH ASSISTANCE	4/12/91	MATERIEL DEVELOPER
FACILITY SUPPORT ANNEX PROVIDED	4/23/91	MATERIEL DEVELOPER
LONG LEAD TIME ITEMS ON CONTRACT	5/24/91	MATERIEL DEVELOPER
INITIAL NETP DISTRIBUTED	6/25/91	MATERIEL DEVELOPER
BOIP/QQPRI CHECKPOINT I	9/28/91	COMBAT DEVELOPER
LOGISTIC DEMONSTRATION STARTED	10/28/91	MATERIEL DEVELOPER
INDIV/KEY PERS TRAINING COURSE COMPL	10/31/91	MATERIEL DEVELOPER
LOGISTIC DEMONSTRATION COMPLETED	3/ 5/92	MATERIEL DEVELOPER
DISTRIBUTION GUIDANCE PROV DEVELOPER	3/10/92	HQDA
ABOIPFD/AQQPRI SUBMITTED TO EARA	6/14/92	MATERIEL DEVELOPER

TRAINING DEVICE CONTRACT AWARDED	6/18/92	PM TRADE
ABOIP/AQQPRI FORWARDED TO TRADOC	6/26/92	EARA
BOIP/QQPRI CHECKPOINT II	8/27/92	MATERIEL DEVELOPER
INDIVID COLLECT TRNG PLAN APPR/DISTR	9/23/92	TRAINER
EARLY USER TEST & EXPERIMENTATION COMPLETED	9/24/92	MATERIEL DEVELOPER
FOLLOW-ON OPERATIONAL TEST AND EVALUATION BEGUN	10/ 1/92	COMBAT DEVELOPER
FCA COMPLETED	11/13/92	MATERIEL DEVELOPER
DATA COLLECTION REQMNT ESTABLISHED	12/16/92	MATERIEL DEVELOPER
USAREUR LON AND DRAFT MFP DISTRIBUTED	1/10/93	MATERIEL DEVELOPER
PCA COMPLETED	1/25/93	MATERIEL DEVELOPER
DEPOT MAINTENANCE SPRT PLAN PREPARED	2/ 2/93	MATERIEL DEVELOPER
ABOIP/AQQPRI TO HQDA	2/ 4/93	COMBAT DEVELOPER
DRAFT TECH MANUALS FROM CONTRACTOR	2/17/93	MATERIEL DEVELOPER
USAREUR LON RESPONSE	3/13/93	GAINING MACOM
USAREUR DMFP CMTS/MSP SUBMITTED	3/13/93	GAINING MACOM
ABOIP/AQQPRI/AMOS APPROVED	3/13/93	HQDA
TRANSPORTABILITY REPORT APPROVED	3/18/93	MTMC
CRITICAL DESIGN REVIEW	4/ 8/93	MATERIEL DEVELOPER
UPDATED ILSP AVAILABLE	4/17/93	MATERIEL DEVELOPER
CONDUCT FORMAL PROVISIONING CONFERENCE	4/18/93	MATERIEL DEVELOPER
USAREUR DISTRIBUTION PLAN COMPLETED	5/ 2/93	GAINING MACOM
PRODUCIBILITY ENGR/PLANNING COMPLETED	5/ 3/93	MATERIEL DEVELOPER
UPDATED DCP COMPLETED	5/17/93	COMBAT DEVELOPER
BOIP/AMOS PUBLISHED	5/26/93	COMBAT DEVELOPER

FINAL PRR SCHEDULED	6/ 1/93	MATERIEL DEVELOPER
TPS MGMT PLAN APPROVED	6/16/93	MATERIEL DEVELOPER
TECH DATA PACKAGE PREPARED	6/16/93	MATERIEL DEVELOPER
DCSLOG ILS REVIEW III	6/16/93	HQDA
STANDARD LIN ASSIGNED	6/16/93	MATERIEL DEVELOPER
MILESTONE DECISION REVIEW III	7/15/93	HQDA
TYPE CLASSIFICATION APPROVED	7/25/93	MATERIEL DEVELOPER
PRODUCTION SOLICIT DOC (SD) RELEASED	7/30/93	MATERIEL DEVELOPER
CONTRACT FOR TECH ASSISTANCE AWARDED	9/13/93	MATERIEL DEVELOPER
PRODUCTION CONTRACT AWARDED	9/28/93	MATERIEL DEVELOPER
BOIP INCLUDED IN CTU	11/ 3/93	COMBAT DEVELOPER
INDIVIDUAL TNG PLAN PROPOSAL RECEIVED	1/ 4/94	TRAINER
BOIP/MOS DECISION PUBLISHED	1/ 4/94	COMBAT DEVELOPER
USAREUR MTOE/TDA IMPLEMENTED	4/13/94	GAINING MACOM
COURSE CLASS SCHEDULES COMPLETED	5/ 8/94	TRAINER
TRAINING LITERATURE DISTRIBUTED	6/ 2/94	TRAINER
USAREUR UMFP PROJECT CODE ASSIGNED	6/ 2/94	MATERIEL DEVELOPER
USAREUR FINAL DRAFT MFP w/MFA DISTRIB	6/ 2/94	MATERIEL DEVELOPER
TRAINING DEVICES AVAILABLE	9/ 9/94	PM TRADE
USAREUR MRL FOR TP/UMF FORWARDED	11/10/94	MATERIEL DEVELOPER
IPT COMPLETED	11/22/94	MATERIEL DEVELOPER
MOS TRAINING INITIATED	11/22/94	TRAINER
DATA COLLECTION PLAN APPROVED	11/22/94	MATERIEL DEVELOPER
USAREUR FINAL MFP DISTRIBUTED	11/22/94	MATERIEL DEVELOPER
USAREUR MSL RETURNED	1/23/95	GAINING MACOM
RPSTL SUBMITTED FOR PUBLICATION	2/ 5/95	MATERIEL DEVELOPER

TM'S SUBMITTED FOR PUBLICATION	4/20/95	MATERIEL DEVELOPER
TECH ASSISTANCE AVAILABLE	5/27/95	MATERIEL DEVELOPER
DMWR AVAILABLE FOR DISTRIBUTION	6/15/95	MATERIEL DEVELOPER
REPAIR PARTS AVAILABLE	7/ 3/95	MATERIEL DEVELOPER
TM'S AVAILABLE FOR DISTRIBUTION	7/ 3/95	MATERIEL DEVELOPER
TMDE & MAT SYS TRNG SUP ITEMS FIELDED	7/ 3/95	MATERIEL DEVELOPER
CONDITIONAL RELEASE APPROVED	7/ 3/95	MATERIEL DEVELOPER
USAREUR CALL FORWARD RECEIVED	7/ 3/95	MATERIEL DEVELOPER
CLS/ICS CONTRACT AWARDED	7/22/95	MATERIEL DEVELOPER
DMPE AVAILABLE AT OVERHAUL FACILITY	8/ 9/95	MATERIEL DEVELOPER
ORGANIZATIONAL SUPPORT EQUIP ASSESSED	8/ 9/95	MATERIEL DEVELOPER
FULL RELEASE APPROVED	8/ 9/95	MATERIEL DEVELOPER
TPS DELIVERED	8/16/95	MATERIEL DEVELOPER
USAREUR FIRST UNIT EQUIPPED	9/15/95	MATERIEL DEVELOPER
INITIAL DEPOT CAPABILITY ESTABLISHED	3/14/96	MATERIEL DEVELOPER

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(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) LOGISTICS SUPPORT ANALYSIS STRATEGY

COMPILED BY:

LOGISTICS CENTER (LOGC)

ARMORED FAMILY OF VEHICLES

(U) LOGISTIC SUPPORT ANALYSIS STRATEGY

(This Section Is Unclassified)

1 MAY 87

U.S. ARMY LOGISTICS CENTER
FT LEE, VIRGINIA

ARMORED FAMILY OF VEHICLES

LOGISTIC SUPPORT ANALYSIS STRATEGY

1. PURPOSE:

The purpose of this early Logistic Support Analysis (LSA) Strategy is to provide the essential philosophy, information and direction required to begin the process that will contribute to the accomplishment of a successful Integrated Logistic Support Program for the Armored Family of Vehicles. Strategy will primarily address the minimum amount of LSA that should be accomplished prior to the 4th Qtr 87 ASARC, where the Program will enter its Proof of Principle phase of acquisition. The Strategy will be updated as the system proceeds through the acquisition cycle. This Strategy identifies:

a. the management philosophy for the AFV LSA Program.

b. the players in the front-end LSA effort.

c. the tasks that must be accomplished and how those tasks will be documented.

2. SYSTEM DESCRIPTION:

a. The objective of the AFV effort is to develop and field an effective force capable of defeating the threat from the 1990's past the turn-of-the-century. The force will be developed within the AirLand Battle Doctrine. It will be capable of sustained operations and reflect sizeable reductions in operating and support costs. Maximized commonality across the armored fleet (vehicles, components and piece parts) will be a primary goal to achieve the lower O&S costs. A common battlefield signature and common vetronics architecture is desired. Other requirements include:

(1) Increased deployability

(2) Increased battlefield supportability

(3) Simple and effective supportability procedures

(4) A comprehensive training system with heavy emphasis upon embedded training for both operators and maintainers

(5) Smaller and lighter weight vehicles

(6) Design characteristics that will facilitate future improvement

(7) Reduced crewsize

(8) Reduced production costs

b. The AFV addresses the multiplicity of armored vehicle systems, chassis, power trains and sub-systems in the current fleet that prevent the realization of significant force economies and development of an effective fighting force in light of known threat capabilities.

c. The AFV Program is being developed under the Army Streamlined Acquisition Program (ASAP) and is currently in the Requirements/Tech Base activities phase. The AFV will enter its Proof of Principle phase after the "Go Ahead" Army Systems Acquisition Review Council (ASARC) scheduled for 4th Qtr 87. The expected roles/missions for the AFV vehicles and those vehicles to be replaced by AFV are in the AFV Umbrella Operational and Organization Plan, 28 October 1985. This Plan is currently being updated by the Army Training & Doctrine Command (TRADOC) with TRADOC approval expected by 31 Dec 88. Essentially, the plan requires replacement of approximately 15 current or projected vehicles/families (e.g., tanks, howitzers, APC's) with a common family of mission oriented vehicles. The AFV will be operated throughout the theater in combat, combat support (CS), and combat service support (CSS) units. The AFV will be the basis of the armored vehicle inventory from the mid-1990's until the next AFV is designed after the turn-of-the-century. Potential AFV vehicles include:

(1) Future Armored Combat System (FACS)

(2) Reconnaissance

(3) Light FACS

(4) Infantry Fighting Vehicle

(5) Mortar Weapons System

(6) General Purpose Carrier

(7) Kinetic Energy Missile

(8) Directed Energy Weapon

(9) Cannon

(10) Elevated Target Acquisition (ETAS)

(11) Fire Support/Combat Lasing

(12) Rocket/Missile

(13) Sapper

(14) Combat Mobility

(15) Combat Excavator

(16) Combat Earthmover

(17) Gap Crosser

(18) Mine Dispensing

(19) Rearm/Refuel

(20) Ambulance

(21) Armored Maintenance

(22) Recovery (M88 FO)

(23) Armored Escort/Security

(24) Intelligence & Electronic Warfare

(25) Command and Control

(26) NBC Reconnaissance

(27) Smoke Support

(28) Non-Line-of-Sight-Heavy (NLOS-H)

(29) Line-of-Sight-Forward-Heavy (LOS-F-H)

3. SUPPORTABILITY OBJECTIVES: Throughout development, the AFV program will have an O&S cost reduction target of 40% with emphasis placed in the following areas:

a. Design Influence.

(1) The AFV design will emphasize commonality of major components (e.g., chassis, engines, transmissions).

(2) Modularity will be a design feature with maximum use of plug-in/plug-out, miniaturized, microcircuitry components.

(3) The AFV must be designed to contain redundant critical subsystems and circuits.

(4) The AFV will be designed to simplify maintenance tasks permitting the use of lower skill level maintenance and crew personnel.

(5) Design emphasis will be given to reducing the weight of AFV components without compromising durability and reliability.

(6) Design will incorporate human factors, safety & health hazard parameters identified in man-machine interface analyses.

(7) Design will consider the use of non-developmental items to the extent feasible.

{* (8) Design will incorporate built-in prognostic and diagnostic capabilities, standard buss structures and standard diagnostic connector assemblies.}

{* (9) Design emphasis will be placed on Reliability, Availability and Maintainability (RAM) characteristics of the AFV to reduce operation and support costs.}

b. Maintenance Plan.

(1) The AFV will have self-diagnostic/prognostic and ease of repair capabilities utilizing a three-level maintenance system (operator/maintainer {* unit}, intermediate and echelons-above-corps).

(2) The AFV modular components will be stored at the lowest levels consistent with unit capabilities.

(3) Repair at the lower levels will be accomplished by component/line replaceable unit (LRU) replacement using common tools to the extent possible.

(4) Maximum use will be made of operator maintenance.

c. Manpower and Personnel.

(1) The personnel in units equipped with the AFV must be capable of operating in a Nuclear, Biological, and Chemical (NBC) environment for periods of 72 hours or longer without performance degradation.

(2) The AFV development will plan on using existing skills to operate and maintain the system minimizing the generation of new skills and new Military Occupational Specialties (MOS).

(3) Maintenance requirements will not result in AFV crew size increases.

(4) AFV design will incorporate advanced technology to reduce the requirements for high soldier skill levels and upper mental category soldiers and to reduce crew fatigue and stress through ease of operation and maintenance.

d. Supply Support.

(1) The use of component commonality/modularity will be studied to determine the potential to reduce requirements for repair parts. {DELETED: Modularity of components will reduce requirements for repair parts significantly.}

(2) Class III resupply (* Refueling) will be accomplished utilizing the Standard Army Refuel System (SARS). The use of standard and readily available tools and TMDE should reduce tool/TMDE proliferation.

e. Support Equipment and TMDE.

(1) To the maximum extent feasible, the AFV will use standard TMDE, tools, and support equipment.

(2) The AFV will have built-in prognostic and diagnostic test equipment, will have standard buss structures, standard (* will standardize and minimize) diagnostic connector assemblies and, taking maximum advantage of technology, a self-repair capability.

(3) The use of robotics for maintenance tasks will be exploited, where feasible.

(* (4) If automatic test equipment is required at intermediate levels of maintenance, the AFV will be supported by Intermediate Forward Test Equipment (IFTE).)

f. Training and Training Devices.

(1) AFV simulators and training devices will be designed and fabricated prior to (* concurrent with) the construction of engineering prototypes.

(2) The goal of simulator and training device design will be assist AFV human factors engineers in producing AFV which are relatively simple to operate and maintain.

(3) Soldier performance in training must be linked to an automatic feedback system for directing operators and maintainers to make training adjustments.

(4) AFV will utilize embedded training for both operators and maintainers.

g. Computer Resources Support. Issues and management procedures unique to the acquisition, development, test, evaluation, and support of embedded or stand-alone system software will be developed for the AFV Program.

h. Transportation and Transportability: the AFV will reduce Army transportation requirements for air, water, highway or rail transport and will not exceed operational area transportation restrictions.

i. Standardization and Interoperability. Standardization and Interoperability (S&I) requirements will be considered throughout the AFV development process.

4. Methodology.

a. General. This Strategy will structure the management of AFV LSA. The Strategy will provide the minimal level of effort required to accomplish a successful LSA program; tasks can be expanded as the players see fit. Early LSA for the AFV Program will be performed by both contractor and Army personnel. {* Early LSA tasks will be performed at either family (overall) or vehicle level.} for any combination of three levels: family, chassis, and variant. Proposed tasks will be performed at either level (or both) based on feasibility and payback. This Strategy and the subsequent LSA Plan will identify at what levels the tasks will be performed. The intent of early LSA (Requirements/Tech Base Activities) is to ensure that supportability is addressed during the early design work (where supportability/soldier interface design can be most influenced) and should be accomplished with a minimal burden of documentation requirements. Documentation of tasks will maximize use of typical materiel acquisition documentation and minimize the need to develop any unique LSA documentation.

b. Management. Lead for the LSA effort during Requirements/Tech Base Activities is the Combat Developer (TRADOC-LOGC lead). Lead will transfer to the Materiel Developer (AMC-TACOM lead) after the "Go Ahead" ASARC. Early LSA will be managed by an LSA Joint Working Group (LSA JWG) chaired by the Logistics Center. The LSA JWG will be a sub-group of the ILS Management Team chaired by the AFV Task Force.

c. Membership. Proposed membership of the LSA JWG follows:

(1) Logistics Center (chair)

(2) AFV Task Force

(3) Tank-Automotive Command (TACOM-lead Materiel Developer)

(4) Materiel Readiness Support Activity (MRSA)

(5) Laboratory Command (LABCOM)

(6) Army Materiel Systems' Analysis Activity (AMSAA)

(7) Logistics' Evaluation Agency (LEA)

(8) Combined Arms Center (CAC)

(9) Soldier Support Center-National Capitol Region (SSC-NCR)

(10) Armor School

(11) Field Artillery School

(12) Infantry School

(13) Air Defense Artillery School

(14) Engineer School

(15) Ordnance Center & School

(16) Intelligence Center & School

(17) Chemical School

(18) Military Police School

(19) Transportation School

(20) Quartermaster School

(21) Ordnance Missile & Munitions Center & School

(22) Signal Center

(23) Academy of Health Sciences

(24) HQ TRADOC (associate)

(25) HQ AMC (associate)

(26) Military Traffic Management Command Transportation Engineering Agency (MTMCTEA, associate)

(27) Operational Test Evaluation Agency (OTEA-associate)

(28) Test & Evaluation Command (TECOM-associate)

(29) Contractors (associate as required by TACOM)

{* (30) Depot Support Command (DESCOM)}

c. Tasks. The following LSA tasks for the AFV Program will be accomplished prior to the "Go Ahead" ASARC.

(1) Task 101 - Logistic Support Analysis Strategy.

(a) Objective: To document a proposed program that will prescribe and govern the LSA performed at all levels (family/ chassis/ and vehicle).

(b) Responsibility: LOGC.

(c) Level: Family.

(d) Documentation: AFV LSA Strategy.

(2) Task 102 - Logistic Support Analysis Plan (LSAP).

(a) Objective: To expand on the Strategy by establishing milestones and subtasks that must be accomplished before the ASARC.

(b) Responsibility: LOGC.

(c) Level: Family.

(d) Documentation: AFV LSA Plan.

(3) Task 103 - Program & Design Reviews.

(a) Objective: To {* capture LSA results and} review the progress of the AFV LSA effort (Contractor and Army in-house).

(b) Responsibility: LOGC.

(c) Levels: *AIII* {* Family/Vehicle.}

(d) Documentation: {* Charts/Trip reports of Program & Design Reviews,} minutes of support related reviews.

(4) Task 201 - Use Study.

(a) Objective: To identify pertinent support factors (operational requirements, transportation modes, environmental requirements, etc) related to the intended use of the system.

(b) Responsibility: LOGC/Appropriate TRADOC School *CAC {family and chassis level} TRADOC Schools {variant level.}*

(c) Levels: *AIII* {* Vehicle.}

(d) Documentation:

1. Background: Supporting studies (DARPA Armor/Anti-Armor Study, CAMAA, Battlefield Development Plans 85 and 86, Total Tank Systems Study, etc.).

2. Actual: O&O Plan and Annexes (to include Operational Mode Summary/Mission Profile-OMS/MP), {* Use Study Assessment}, *Chassis Use Study Report*, Draft ROC and supporting annexes.

(5) Task 202 - Mission Hardware, Software & Support System Standardization.

(a) Objective: To identify supportability constraints and design characteristics that will maximize AFV hardware and support system standardization.

(b) Responsibility: Constraints - CAC (Family), Schools (Vehicle); Design Characteristics - TACOM.

(c) Levels: Family/Vehicle.

(d) Documentation: Constraints - O&O Plan and Annexes, Draft ROC and annexes, Draft ILS Plan and other relevant supporting studies; Design Characteristics - Contractor and TACOM Best Technical Approaches (BTA).

(6) Task 203 - Comparative Analysis.

(a) Objective: To compare AFV concept with the currently envisioned future fleet (Baseline Comparison System) identifying O&S cost drivers and force structure impacts.

(b) Responsibility: LOGC {* Drivers-LOGC and MANPRINT Joint Working Group; Impacts-LOGC.}

(c) Level: Family.

(d) Documentation: Drivers - LOGC Commonality Study, AFVTF O&S Cost Drivers Briefing, {* Cost & Economic Analysis Center (CEAC) AFV Sustainment Cost Analysis Report}, MANPRINT Early Comparability Analysis, and Contractors' Final Reports; Impacts - LOGC Supportability Analysis Final Report.

(7) Task 204 - Technological Opportunities.

(a) Objective: To identify technological advancements and state-of-the-art design approaches which offer opportunities for achieving system support improvements.

(b) Responsibility: AFVTF.

(c) Levels: All {* Family.}

(d) Documentation: O&O Plan and Annexes, Draft ILS Plan, and Draft ROC.

{* 1. Background: Close Combat Heavy Mission Area Materiel Plan (CCH-MAMP), and LABCOM Notional System Strategies.

2. Actual: TACOM and Contractor BTAs, and AFVTF Technology Study Report.}

(8) Task 205 - Supportability and Supportability Related Design Factors.

(a) Objective: To identify support and support related design objectives for inclusion in program documents and specifications.

(b) Responsibility: CACOA/LOGC. {* AFVTF.}

(c) Levels: All. {* Family.}

(d) Documentation: Draft ILS Plan. O&O Plan and Annexes/ Contractor Final Reports and Draft ROC/

(9) Task 301 - Functional Requirements Identification.

(a) Objective: To identify broad operator and maintainer functions for the AFV.

(b) Responsibility: AFV MANPRINT Joint Working Group, TACOM.

(c) Levels: All/ {* Family.}

(d) Documentation: Draft ILS Plan and Draft ROC.

{* - 1. Background: O&O Plan and Annexes, Draft AFV MANPRINT Management Plan.

2. Actual: {* AFV Target Audience Descriptions (TADs)}, Contractor Final Reports.

(10) Task 302 - Support System Alternatives/Task 303 - Evaluation of Alternatives & Tradeoff Analysis.

- {* (a) Objective:

1. To review the impact of having vehicle operators perform a large amount of unit level maintenance.

2. To review the support concept required for a heavy battalion composed of two armor companies and two mechanized infantry companies.

(b) Responsibility: LOGC.

(c) Level: Family.

(d) Documentation: LOGC AFV Supportability Analysis Final Report.}

[a] Objective/ To identify support system alternatives for the AFV in view of its family-oriented design approach/
[b] Responsibility/ LOGC/
[c] Level/ Family/
[d] Documentation/ LOGC Supportability Analysis Final Report and Contractor Final Reports/

(11) Task 303 - Evaluation of Alternatives & Tradeoff Analysis.
(a) Objective: To identify the optimum support concept alternative.
(b) Responsibility: LOGC.
(c) Level: Family.
(d) Documentation: LOGC Supportability Analysis Final Report and Contractor Final Reports.

(11) Task 501 - Supportability Test, Evaluation and Verification.

(a) Objective: To identify supportability issues and criteria. {* initiate supportability test planning.}

(b) Responsibility: AFV Test Integration Working Group.

(c) Level: Family.

(d) Documentation: O&O Plan Critical Issues & Criteria, AFV Test Evaluation Master Plan (TEMP).

(* (13) Task 601 - Handoff of LSA Lead from Combat Developer to Materiel Developer.

(a) Objective: To ensure the LSA results of the Requirements/Tech Base Activities Phase feeds the MD led effort in Proof of Principle.

(b) Responsibility: LOGC.

(c) Level: N/A.

(d) Documentation: Complete LSA file.}

(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) LOGISTICS SUPPORT ANALYSIS PLAN

COMPILED BY:

LOGISTICS CENTER (LOGC)

ARMORED FAMILY OF VEHICLES

(U) LOGISTIC SUPPORT ANALYSIS PLAN

(This Section Is Unclassified)

1 MAY 87

U.S. ARMY LOGISTICS CENTER
FT LEE, VIRGINIA

ARMORED FAMILY OF VEHICLES
LOGISTIC SUPPORT ANALYSIS PLAN

1. PURPOSE:

The purpose of this Logistic Support Analysis Plan (LSAP) is to outline the players, tasks, subtasks and milestones required to accomplish a successful LSA Program for the Armored Family of Vehicles (AFV). The Plan primarily addresses the minimum amount of LSA that must be accomplished prior to the 4th Qtr 87 milestone decision review, where the Program will enter its Proof of Principle phase of acquisition. The intent of the early LSA (Requirements/Tech Base Activities) dictated by this Plan is to ensure that supportability is addressed during the early design work where supportability can be most influenced. The Plan will be updated as the system proceeds through the acquisition cycle. This Plan identifies:

a. The players in the front-end LSA effort.

b. The tasks and subtasks that must be accomplished and how those tasks/subtasks will be completed and documented.

c. The milestones required to complete the effort in a timely manner.

2. SYSTEM DESCRIPTION:

a. The objective of the AFV effort is to develop and field an effective force capable of defeating the threat from the 1990's past the turn-of-the-century. The force will be developed within the AirLand Battle Doctrine. It will be capable of sustained operations and reflect sizeable reductions in operating and support costs. Maximized commonality across the armored fleet (vehicles, components and piece parts) will be a primary goal to achieve the lower O&S costs. A common battlefield signature and common vetronics architecture is desired. Other requirements include:

(1) Increased deployability.
(2) Increased battlefield supportability.
(3) Simple and effective supportability procedures.
(4) A comprehensive training system with heavy emphasis upon embedded training for both operators and maintainers.
(5) Smaller and lighter weight vehicles.
(6) Design characteristics that will facilitate future improvements.
(7) Reduced crew size.
(8) Reduced production costs.

b. The AFV addresses the multitude of different armored vehicle systems, chassis, power trains and sub-systems in the current fleet that prevent the realization of significant force operating and support economies.

c. The AFV Program is being developed under the Army Streamlined Acquisition Program (ASAP) and is currently in the Requirements/Tech Base Activities phase. The AFV will enter its Proof of Principle phase after the "Go Ahead" Army Systems Acquisition Review Council (ASARC) scheduled for 4th Qtr 87. The expected roles/missions for the AFV vehicles along with those vehicles the AFV will replace are in the AFV Umbrella Operational and Organization (O&O) Plan, 28 October 1985. The O&O Plan is currently being updated by the U.S. Army Training & Doctrine Command (TRADOC). Essentially, the O&O Plan requires replacement of approximately 15 current or projected vehicles/families (e.g., tanks, howitzers, etc.) with a common family of mission specific vehicles. The AFV will be operated throughout the theater in combat (C), combat support (CS), and combat service support (CSS) units. The AFV will be the basis of the armored vehicle inventory from the mid-1990's until the next AFV is designed after the turn-of-the-century. Potential AFV vehicles include:

(1) Future Armored Combat System (FACS)
(2) Reconnaissance
(3) Light FACS
(4) Infantry Fighting Vehicle
(5) Mortar Weapons System
(6) General Purpose Carrier
(7) Kinetic Energy Missile
(8) Directed Energy Weapon
(9) Cannon
(10) Elevated Target Acquisition (ETAS)
(11) Fire Support/Combat Lasing
(12) Rocket/Missile
(13) Sapper
(14) Combat Mobility
(15) Combat Excavator
(16) Combat Earthmover
(17) Gap Crosser
(18) Mine Dispensing
(19) Rearm/Refuel
(20) Ambulance
(21) Armored Maintenance
(22) Recovery (M88 FO)
(23) Armored Escort/Security
(24) Intelligence & Electronic Warfare
(25) Command and Control
(26) Nuclear, Biological, and Chemical (NBC) Reconnaissance
(27) Smoke Support
(28) Non-Line-of-Sight-Heavy (NLOS-H)
(29) Line-of-Sight-Forward-Heavy (LOS-F-H)

3. SUPPORTABILITY OBJECTIVES: Throughout development, the AFV program will have an O&S cost reduction target of 40% with emphasis placed in the following areas:

a. Design Influence.

(1) The AFV design will emphasize commonality of major components (e.g., chassis, engines, transmissions).

(2) Modularity will be a design feature with maximum use of plug-in/plug-out, miniaturized, microcircuitry components.

(3) The AFV must be designed to contain redundant critical subsystems and circuits.

(4) The AFV will be designed to simplify maintenance tasks permitting the use of lower skill level maintenance and crew personnel.

(5) Design emphasis will be given to reducing the weight of AFV components without compromising durability and reliability.

(6) Design will incorporate human factors, safety & health hazard parameters identified in man-machine interface analyses.

(7) Design will consider the use of non-developmental items (NDI) to the extent feasible.

(8) The AFV design will incorporate built-in prognostic and diagnostic capabilities, standard buss structures and standard diagnostic connector assemblies.

(9) Design emphasis will be placed on improving Reliability, Availability, and Maintainability (RAM) characteristics of the AFV to reduce operation and support costs.

b. Maintenance Plan.

(1) The AFV will have self-diagnostic/prognostic and ease of repair capabilities utilizing a three-level maintenance system (unit, intermediate and echelons-above-corps).

(2) The AFV modular components will be stored at the lowest levels consistent with unit capabilities.

(3) Repair at the lower levels will be accomplished by component/Line Replaceable Unit (LRU) replacement using common tools to the extent possible.

(4) Maximum use will be made of operator maintenance.

c. Manpower and Personnel.

(1) The personnel in units equipped with the AFV must be capable of operating in a NBC environment.

(2) The AFV development will plan on using existing skills to operate and maintain the system avoiding, to the extent possible, the generation of new Military Occupational Specialties (MOSs).

(3) Maintenance requirements will not result in AFV crew size increases.

(4) AFV design will incorporate advanced technology to reduce the requirements for high soldier skill levels and upper mental category soldiers and to reduce crew fatigue and stress through ease of operation and maintenance.

d. Supply Support.

(1) .The use of component commonality/modularity will be studied to determine the potential to reduce requirements for repair parts.

(2) Refueling will be accomplished utilizing the Standard Army Refuel System (SARS).

e. Support Equipment and Test, Measurement, and Diagnostic Equipment (TMDE).

(1) To the maximum extent feasible, the AFV will be supported by standard tools, TMDE and support equipment.

(2) The AFV will have built-in prognostic and diagnostic test capabilities, will have standard buss structures, will standardize and minimize diagnostic connector assemblies and, taking maximum advantage of technology, a self-repair capability.

(3) The use of robotics for maintenance tasks will be exploited, where feasible.

(4) If automatic test equipment is required at intermediate levels of maintenance, the AFV will be supported by Intermediate Forward Test Equipment (IFTE).

f. Training and Training Devices.

(1) AFV simulators and training devices will be designed and fabricated concurrent with the construction of engineering prototypes.

(2) The goal of simulator and training device design is to replicate the end item in order to offset AFV system O&S, OPTEMPO, and ammunition costs.

(3) Soldier performance in training must be linked to an automatic feedback system for directing operators and maintainers to make training adjustments.

(4) AFV will utilize embedded training for both operators and maintainers.

g. Computer Resources Support. Issues and management procedures unique to the acquisition, development, test, evaluation, and support of embedded or stand-alone system software will be developed for the AFV Program.

h. Transportation and Transportability. The AFV will reduce Army transportation requirements for air, water, highway or rail transport and will not exceed operational area transportation restrictions.

i. Standardization and Interoperability. Standardization and Interoperability (S&I) requirements will be considered throughout the AFV development process.

4. Methodology.

a. General. This Plan structures the management of AFV LSA. The Plan will lay down the minimal level of effort required to accomplish a successful LSA program; tasks can be expanded as the players see fit. Early LSA for the AFV Program will be performed by both contractor and Army personnel. Early LSA tasks will be performed at either family (overall) or vehicle level. Proposed tasks/subtasks will be performed at either level (or both) depending on feasibility and payback. Vehicle level LSA will primarily be the responsibility of the appropriate TRADOC School (see para. 4.c). Schools may expand the LSA effort for a variant as they see fit. Schools may choose to initiate a full-blown LSA program for appropriate variants as long as the effort is consistent with this Plan. Schools will be required to provide the status of their entire program to the AFV LSA Joint Working Group (JWG) for review. This LSA Plan identifies what tasks must be accomplished, how each task will be performed, how each task will be documented, the responsible agency, and the timeframe to accomplish each task. The early LSA performed under the purview of this Plan will be accomplished with a minimal burden of documentation requirements. Documentation of the effort will maximize use of typical materiel acquisition documents and minimize the need to develop any unique LSA documents. Table 1 shows graphically the tasks that must be accomplished, the responsible agency, and documentation of each task.

b. Management. Lead for the LSA effort during the Requirements/Tech Base Activities development phase is the Combat Developer (CD), TRADOC-Logistics Center (LOGC) lead. Lead will transfer to the Materiel Developer (MD) after the "Go Ahead" ASARC. Early LSA will be managed by an LSA JWG chaired by the LOGC. As the chair, LOGC will be the office of record for the AFV LSA Program responsible for maintaining a file of all AFV LSA accomplishments. The LSA JWG will be a sub-group of the Integrated Logistic Support Management Team (ILSMT) chaired by the AFV Task Force. Issues pertaining to AFV LSA must be brought to the attention of the LSA JWG through the chair for resolution.

TABLE 1

OVERVIEW OF THE AFV LSA EFFORT
FOR REQUIREMENTS/TECH BASE ACTIVITIES PHASE

TASK	RESPONSIBILITY	LEVEL	DOCUMENTATION
101-LSA STRATEGY	LOGC	FAMILY	STRATEGY
102-LSA PLAN	LOGC	FAMILY	PLAN
103-REVIEWS	LOGC	FAMILY	MINUTES, ETC
201-USE STUDY	SCHOOLS	VEHICLE	O&O PLAN/ DRAFT ROC
202-STANDARDIZATION CONSTRAINTS	CAC	FAMILY	O&O PLAN/DRAFT ROC
	SCHOOLS	VEHICLE	O&O PLAN/DRAFT ROC
CHARACTERISTICS	TACOM	FAMILY	BEST TECH APPROACH
203-COMPARATIVE ANALYSIS DRIVERS	LOGC	FAMILY	BACKGROUND STUDIES
	MANPRINT JWG	FAMILY	EARLY COMP ANAL
IMPACTS	LOGC	FAMILY	LOGC REPORT
204-TECH OPPORTUNITIES	AFVTF	FAMILY	AFVTF REPORT BEST TECH APPROACH
205-DESIGN FACTORS	AFVTF	FAMILY	ILS PLAN
301-FUNCTIONAL RQMTS ARMY EFFORT	MANPRINT JWG	FAMILY	TARGET AUD DESC
CONTRACTOR EFFORT	TACOM	FAMILY	BEST TECH APPROACH
302-SPT CONCEPT ALT	LOGC	FAMILY	LOGC REPORT
303-COMPARATIVE ANALYSIS	LOGC	FAMILY	LOGC REPORT
501-TEST & EVALUATION	TIWG	FAMILY	AFV ISS & CRIT/TEMP
601-HANDOFF TO MD	LOGC	N/A	LSA FILE

c. Membership. Membership of the LSA JWG follows:

(1) LOGC (chair)
(2) AFV Task Force
(3) TACOM (MO lead)
(4) Materiel Readiness Support Activity (MRSA)
(5) Laboratory Command (LABCOM)
(6) Army Materiel Systems Analysis Activity (AMSAA)
(7) Logistics Evaluation Agency (LEA)
(8) Combined Arms Center (CAC)
(9) Soldier Support Center-National Capitol Region (SSC-NCR)
(10) Armor School
(11) Field Artillery School
(12) Infantry School
(13) Air Defense-Artillery School
(14) Engineer School
(15) Ordnance Center & School
(16) Intelligence Center & School
(17) Chemical School
(18) Military Police (MP) School
(19) Transportation School
(20) Quartermaster School
(21) Ordnance Missile & Munitions Center & School
(22) Signal Center
(23) Academy of Health Sciences
(24) HQ TRADOC (associate)
(25) HQ AMC (associate)
(26) Military Traffic Management Command Transportation Engineering Agency (MTMCTEA-associate)
(27) Operational Test & Evaluation Agency (OTEA-associate)
(28) Test & Evaluation Command (TECOM)
(29) Contractors (associate as required by contracting agency-TACOM)
(30) Depot Support Command (DESCOM)

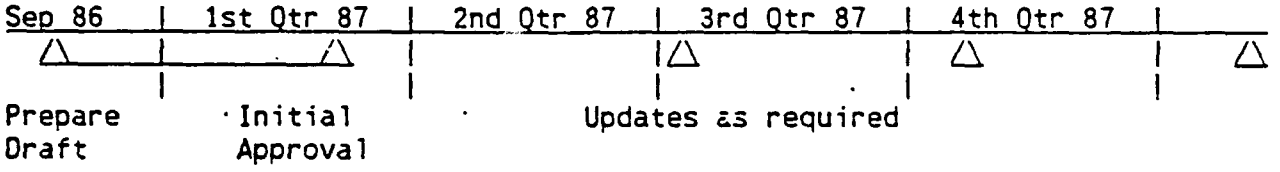
d. Tasks. The following LSA tasks for the AFV Program will be accomplished prior to the "Go Ahead" ASARC. Note that these tasks must be extensively updated when the Program enters the Proof of Principle Phase (MO lead).

(1) Task 101 - LSA Strategy.

(a) Objective: To document a proposed program that will prescribe and govern the LSA performed at all levels (family and vehicle).

(b) Responsibility: LOGC.

(c) Approach: LOGC will develop an AFV LSA Strategy based on current policy and tailored to the AFV acquisition schedule. Strategy will identify the tasks that must be accomplished, the management structure that will control the effort, the players, and how the tasks will be documented. LOGC will prepare the document, staff it to all members of the JWG, host meetings to review, approve, and update the Strategy as required. Timeline is shown below:



(d) Level: Family.

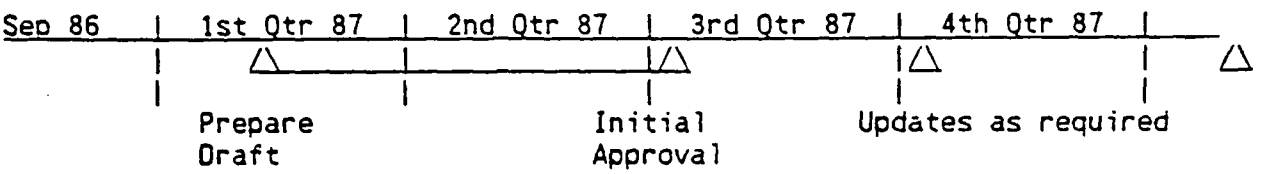
(e) Documentation: AFV LSA Strategy.

(2) Task 102 - LSA Plan.

(a) Objective: To expand on the Strategy by establishing milestones and subtasks that must be accomplished before the ASARC.

(b) Responsibility: LOGC.

(c) Approach: LOGC will develop a plan to accomplish the tasks identified in AFV LSA Strategy prior to the "Go-Ahead" ASARC. Plan must be based on current policy and tailored to the AFV acquisition schedule. Plan will identify the tasks that must be accomplished, the management structure that will control the effort, the players, how the tasks will be accomplished and documented, and a milestone chart to graphically display the timeframes involved. LOGC will prepare the document, staff it to all members of the JWG, host meetings to review, approve, and update the Plan as required. Timeline is shown below:



(d) Level: Family.

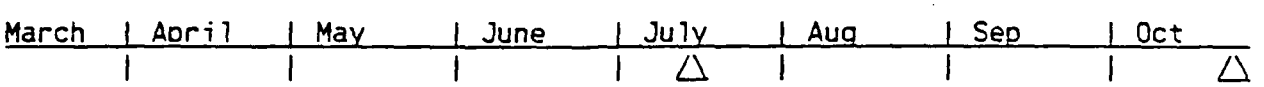
(e) Documentation: AFV LSA Plan.

(3) Task 103 - Program & Design Reviews.

(a) Objective: To capture LSA results and review the progress of the AFV LSA effort (Contractor and Army in-house).

(b) Responsibility: LOGC.

(c) Approach: LOGC, as chair of the LSA JWG, will be responsible for attending and gathering results of all support related program and design reviews. LOGC will assemble appropriate information into the LSA file. LOGC also will schedule and host periodic reviews of the LSA Program's progress. The entire JWG will participate in these reviews where appropriate players will brief the group on the status of their efforts. The review will provide an assessment of the LSA Program. LOGC must document each review in the form of minutes and brief results to the AFV ILSMT as required. Timeline (87) is shown below:



(d) Levels: Family/Vehicle.

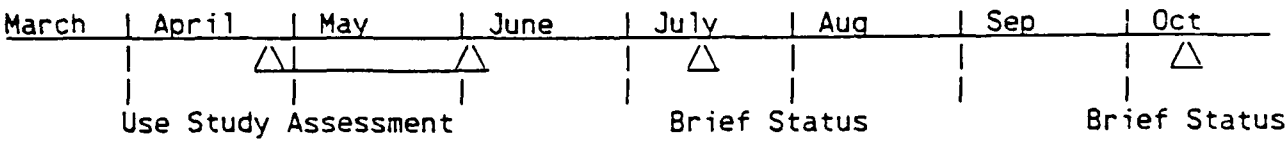
(e) Documentation: Charts/Trip reports of Program & Design Reviews, Minutes of LSA reviews.

(4) Task 201 - Use Study.

(a) Objective: To identify pertinent support factors (operational requirements, transportation modes, environmental requirements, etc) related to the intended use of the system.

(b) Responsibility: LOGC/Appropriate TRADOC Schools.

(c) Approach: In development of each annex of the O&O Plan, the School should first identify the predecessor system (system that the AFV vehicle will replace) and the doctrine under which the proposed system must operate. Then, the School should identify the existing support structure of the predecessor system and any existing support problems/drivers on the predecessor system (this should be accomplished through review/analysis of testing documents, sample data collection efforts, field visits, and coordination with the user). Once the above has been identified, the School should couple the results with the justification of the proposed system (to include Mission Area Analysis (MAA) deficiencies and Study Reports (i.e. Combined Arms MAA, Battlefield Development Plans 85 and 86, Total Tank Systems Study, etc.)) to prepare the O&O Plan. Table 2 reflects O&O Plan/ROC paragraphs that document Use Study information. Since the process leading up to the O&O Plan annexes preceded this LSA Plan, Schools must review the process that resulted in the O&O Plan annexes to determine how much of the Use Study has been accomplished. LOGC will provide a checklist that the Schools will complete. This assessment will be a tool for the Schools to use in Required Operational Capability (ROC) development. Additionally, Schools may want to utilize Table 2 to assist in assessing the O&O process. For ROC development, the Schools must complete an iteration of the above, the extent of which is dependent on the status of the O&O (update all supportability factors in the O&O annex, identify those that were not developed in the O&O annex development, and incorporate the results into the draft ROC annex). Table 2 also identifies how the Use Study should be documented in the ROC. Annex A displays the milestones associated with task completion. Schools will provide O&O annex assessments to the LOGC and periodically brief the status of this effort to the LSA JWG. Timeline (87) is shown below:



(d) Levels: Vehicle.

(e) Documentation:

1. Background: Supporting studies (DARPA Armor/Anti-Armor Study, CAMAA, Battlefield Development Plans 85 & 86, Total Tank Systems Study, etc).

2. Actual: O&O Plan and Annexes (to include Operational Mode Summary/Mission Profile (OMS/MP)), Use Study Assessment, Draft ROC and supporting annexes (when available).

TABLE 2: DOCUMENTATION OF THE USE STUDY

USE STUDY INFORMATION	O&O PLAN	ROC
System Description	Paragraph 1	Paragraph 1
Type Classification Date	Not required	Pargraphs 3 and 11
Date of Initial Deployment	Not required	Paragraph 11
Projected Service Life	Not required	Appendix 2
End Item Cost	Paragraph IX	Paragraph 4
System Mission	Paragraph V	Paragraph 4
Operational Environment	OMS/MP	Appendix 4
Wartime/Peacetime Employment	OMS/MP	Appendix 4
Procurement Quantity	Paragraph IX	Annex A
Item Being Replaced	Paragraph VI	Appendix 4
Major Systems Used with E/I	Paragraph V	Appendix 4
TOE/TA of Using Organization	Paragraph VI	Paragraph 4
Cbt Essential Characteristics	Paragraph II	Paragraph 2
Attrition Factors	Not required	Appendix 3
Maintenance Ratios	Not required	Appendix 3
ALDT	Not required	Appendix 3
Performance Characteristics	Paragraph IV	Paragraph 5
Mission Types	OMS/MP	Appendix 4
Mission Durations	OMS/MP	Appendix 4
Physical Characteristics	Not required	Paragraph 5
Crew Size	Paragraph VI	Paragraphs 4 & 8
Special Purpose Kits	Paragraph VII	Paragraph 5
Unique Maintenance Features	Paragraph VII	Paragraph 7
Init Maint Concept	Paragraph VI	Paragraphs 4 & 8
Special Handling/Testing Cons	Paragraph VII	Paragraph 7
Tools/Test Equipment Required	Para VII if avail	Paragraphs 5 & 7
Maintenance Restrictions	Para VII if avail	Paragraphs 7 & 8
Allowable Maint Periods	Not required	Appendix 3
Transportability Factors	Paragraph VII	Paragraph 5

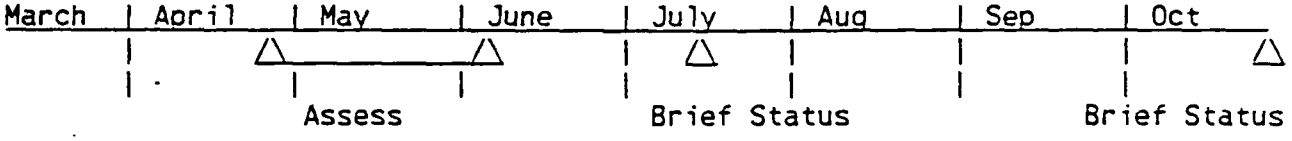
(5) Task 202 - Mission Hardware, Software & Support System Standardization.

(a) Objective: To identify supportability constraints and design characteristics that will maximize AFV hardware and support system standardization.

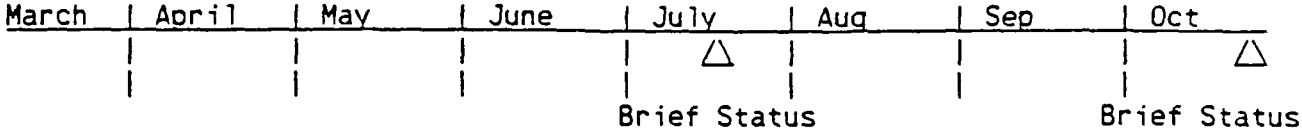
(b) Responsibility: Constraints - CAC (Family), Schools (Vehicle); Design Characteristics - TACOM.

(c) Approach:

1. Constraints. Schools should identify the support structure of the predecessor system and the expected doctrine for the proposed system. Then, the Schools should compare these items with the expected use of the system. From this comparison, the Schools can determine envisioned supportability constraints. Constraints should first be identified in paragraph VII of the O&O annex. Since the O&O annex development process preceded this Plan, Schools must assess the status of their O&O annex to determine the extent to which this task was accomplished. Then, during ROC development, the Schools must again perform the above to identify, update and/or expand the constraints in the ROC annexes. CAC (as the responsible agency for the O&O Plan and ROC), in coordination with the LOGC, will identify umbrella constraints. The first iteration was accomplished with the O&O Plan as a result of the LOGC ILS Review. CAC/LOGC will update these constraints as the Program matures during ROC development. Timeline (87) is shown below:



2. Characteristics. As TACOM's Best Technical Approach (BTA) develops, TACOM will provide to LOGC copies of the BTA, annotating those design characteristics that maximize standardization. Also, TACOM will provide LOGC copies of the contractors' output for this task in accordance with the contract modification. TACOM will brief emerging results to the LSA JWG at LSA reviews. During Proof of Principle, the AFV MD, in the coordination with the CD, will analyze the TACOM BTA along with the contractors' BTA to determine the best design approach for AFV. Timeline (87) is shown below:



(d) Levels: Family/Vehicle.

(e) Documentation:

1. Constraints: O&O Plan and Annexes, Draft ROC and Annexes.

2. Design Characteristics: Contractor and TACOM AFV BTAs.

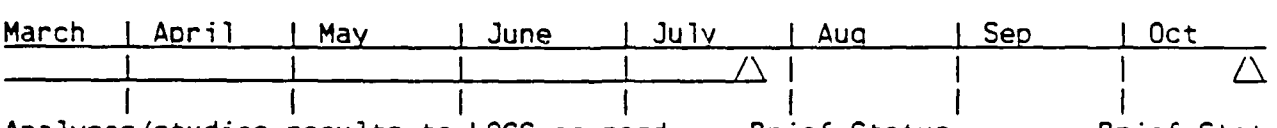
(6) Task 203 - Comparative Analysis.

(a) Objective: To compare AFV concept (objective system) with the currently envisioned future fleet (baseline comparison system) identifying O&S cost drivers and force structure impacts.

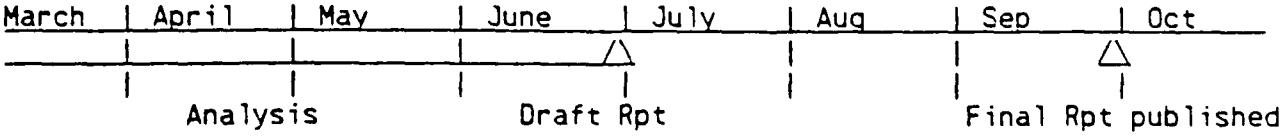
(b) Responsibility: Drivers-LOGC (ATCL-M) and MANPRINT JWG; Impacts-LOGC (ATCL-O).

(c) Approach:

1. Drivers. LOGC, responsible for the AFV LSA file, must compile those analyses/studies that have identified supportability cost drivers that may pertain to AFV. The AFVTF will provide LOGC a copy of their briefing/analysis of O&S cost drivers that was presented to the Deputy Under Secretary of the Army (Operations Research). As the MANPRINT Early Comparability Analyses (ECAs) are completed, the MANPRINT JWG chair must provide LOGC a copy of the analyses for the file. THE AFVTF will provide the Cost & Economic Analysis Center (CEAC) AFV Sustainment Cost Analysis Report to the LOGC. LOGC will excerpt appropriate information from the analyses/studies for the LSA file. TACOM will assemble the contractors' task completions IAW the contract modification and forward to the LOGC for incorporation into the file. Timeline (87) is shown below:



2. Impacts. LOGC (ATCL-O) will be responsible for identifying an order of magnitude estimate of the difference in CSS force structure requirements between supporting an AFV force as opposed to supporting an alternative set containing (1) Product Improved Programs (PIP) vehicles as well as (2) selective introductions of other armored vehicles. This task is being accomplished as part of the LOGC AFV Supportability Analysis; a separate plan has been prepared and is attached at Annex B. Once completed, the analysis report will be incorporated into the LSA file by the LOGC. Timeline (87) is shown below:



(d) Level: Family.

(e) Documentation:

1. Drivers: LOGC Commonality Study, AFVTF O&S Cost Drivers Briefing, CEAC AFV Sustainment Cost Analysis Report, MANPRINT ECAs, and Contractors' Final Reports.

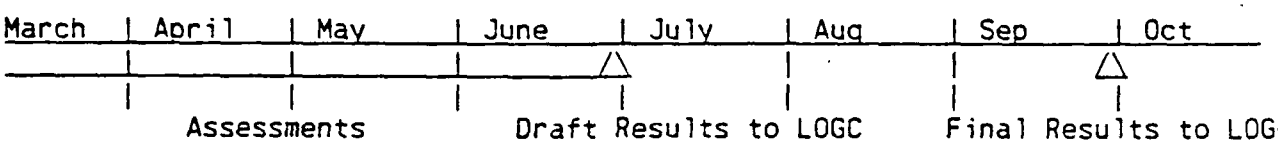
2. Impacts - LOGC Supportability Analysis Final Report.

(7) Task 204 - Technological Opportunities.

(a) Objective: To identify technological advancements and state-of-the-art design approaches which offer opportunities for achieving system support improvements.

(b) Responsibility: AFVTF.

(c) Approach: As part of its charter, AFVTF is analyzing technology opportunities to assess whether technology can support pursuing the AFV concept at this time. The AFVTF, in coordination with TACOM, LABCOM, and AFV contractors, will identify these opportunities and assemble them as a part of the TF ASARC report. The AFVTF will determine those advancements which may offer supportability improvements, annotate them and forward the technology assessment results to LOGC for incorporation into the LSA file. Timeline (87) is shown below:



(d) Levels: Family.

(e) Documentation:

1. Background: Close Combat Heavy Mission Area Materiel Plan (CCH-MAMP), LABCOM Notional System Strategies.

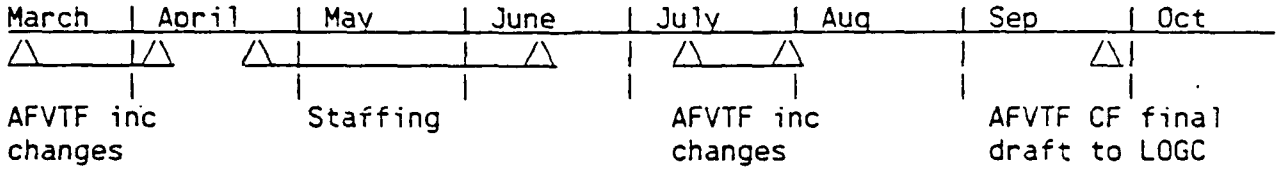
2. Actual: TACOM and Contractor BTAs and AFVTF Technology Study Report.

(8) Task 205 - Supportability and Supportability Related Design Factors.

(a) Objective: To identify support and support related design objectives for inclusion in program documents and specifications.

(b) Responsibility: AFVTF.

(c) Approach: As the 200 series tasksare completed/updated, CAC/LOGC will periodically meet to incorporate emerging results into the umbrella AFV ILS Plan. Prior to these meetings, CAC will staff the Plan to the TRADOC players for review and comment. Updates to this document will be forwarded to the AFVTF for incorporation. Updated versions of the ILS Plan will be added to the AFV LSA file by the LOGC as required. AFVTF will provide final draft (version to go to the ASARC) to LOGC in Sep 87. Timeline (87) is shown below:



(d) Levels: Family.

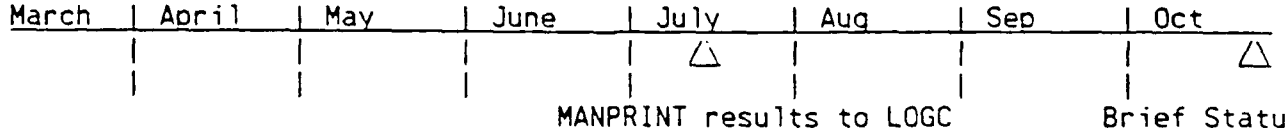
(e) Documentation: Draft ILS Plan.

(9) Task 301 -Functional Requirements Identification.

(a) Objective: To identify broad operator and maintainer functions for the AFV.

(b) Responsibility: AFV MANPRINT JWG; TACOM.

(c) Approach: The AFV MANPRINT JWG will develop operator and maintainer functions (Target Audience Descriptions) IAW the AFV MANPRINT Management Plan (AFVMMP). The JWG chairman will forward the results to the LOGC for incorporation into the LSA file upon completion. JWG chairman must also notify LOGC of any slips in the process as laid out in the AFVMMP. Contractors also must complete this task IAW the AFV contract modification. TACOM will assemble the results and forward them to the LOGC for incorporation into the LSA file. Timeline (87) is shown below:



(d) Levels: Family.

(e) Documentation:

1. Background: O&O Plan and Annexes, Draft AFVMMP.

2. Actual: AFV Target Audience Descriptions (TAJs), Contractor Reports

(10) Task 302 - Support Concept Alternatives/Task 303 -Evaluation of Alternatives & Tradeoff Analysis.

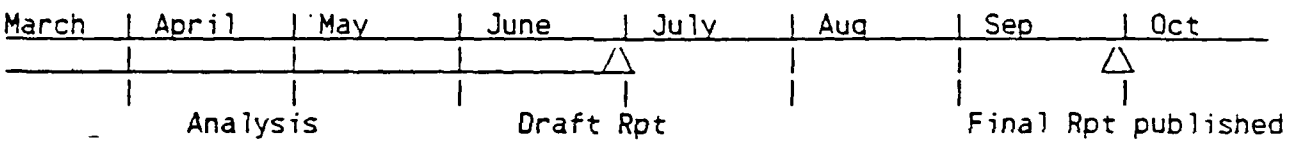
(a) Objective:

1. To review the impact of having vehicle operators perform a large amount of unit level maintenance.

2. To review the support concept required for a heavy battalion composed of two armor companies and two mechanized infantry companies.

(b) Responsibility: LOGC.

(c) Approach: LOGC will review the impacts of having vehicle operators perform an increased amount of unit level maintenance and will review the support concept required for a battalion composed of two armor companies and two mechanized infantry companies. This task will be accomplished as part of the LOGC AFV Supportability Analysis IAW the plan attached at Annex B. Once this analysis is completed the portion addressing this task accomplishment will excerpted and incorporated into the AFV LSA file. Timeline (87) is shown below:



(d) Level: Family.

(e) Documentation: LOGC Supportability Analysis Final Report.

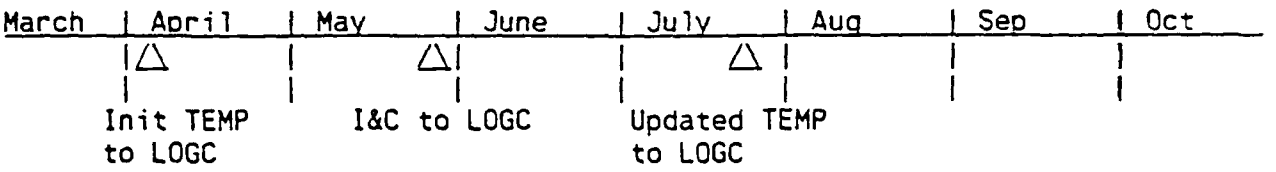
(12) Task 501 - Supportability Test, Evaluation and Verification.

(a) Objective: To initiate supportability test planning.

(b) Responsibility: AFV Test Integration Working Group (TIWG).

(c) Approach: The AFV Test Integration Working Group (TIWG), responsible for preparation of the Test & Evaluation Master Plan (TEMP) for the ASARC, will incorporate supportability test planning into the TEMP. CAC will lead the Schools in identifying family and variant issues and criteria (I&C). During the staffing process, LOGC and appropriate Schools will review and insure that supportability is properly addressed in the I&C. CAC will provide the completed I&C to the LOGC for incorporation into the LSA file. The TIWG will add the completed I&C to the TEMP. Upon initial completion of the TEMP, the TIWG chairman will forward a copy to the LOGC for incorporation into the LSA file. As the TEMP is updated, subsequent versions will be forwarded to the LOGC by the TIWG chairman for the LSA file.

Timeline (87) is shown below:



(c) Level: Family.

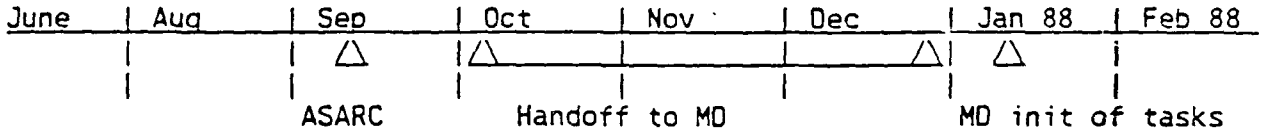
(d) Documentation: AFV O&O Plan Critical I&C, AFV TEMP.

(13) Task 601 - Handoff of LSA lead from Combat Developer to Materiel Develcper.

(a) Objective: To ensure the LSA results of the Requirements/Tech Base Activities phase feeds the MD led effort in Proof of Principle phase.

(b) Responsibility: LOGC.

(c) Approach: Upon completion of the Requirements/Tech Base Activities Phase LSA activities, LOGC, in conjunction with LABCOM, will assemble the LSA file and forward to the MD. LABCOM will lead in getting the individual major subordinate commands (MSCs) involved in the AFV Program. This will include getting the appropriate information from the AFV LSA file to the appropriate MSC. The MSCs will work with the individual TRADOC Schools in accomplishing Proof of Principle (POP) LSA. MD, with LOGC assistance, will update the LSA Strategy, Plan and begin accomplishment of the POP phase LSA tasks. Timeline is shown below:



(d) Documentation: LSA file.

e. Milestones: Milestone chart addressing task completions is at Annex A. Chart summarizes the milestones identified under each task. LSA milestones reflect the iterative nature of the process up to the "Go Ahead" ASARC where the MD will assume the lead (even though the task may have been completed during O&O Plan development, the task must be updated during ROC development and subsequent development phases). The responsible players as identified by this Plan will provide status reports to the LSA JWG as required.

(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) ANNEX A

*7-1-MCL1-005990-100

(U) ANNEX A

(This Annex Is Unclassified)

AFV LSA MILESTONE CHART

PRODUCT	FY 86	FY 87 1ST QTR	FY 87 2ND QTR	FY 87 3RD QTR	FY 87 4TH QTR	FY 88 1ST QTR	FY 88 2ND QTR	FY 88 3RD QTR	FY 88 4TH QTR	FY 89
						ASARC				
		CONCEPT EXPLORATION				PROOF OF PRINCIPLE				
GENERAL										
LSA EXPERTS' MEETING	/\									
1ST LSA JWG		/\								
2ND LSA JWG				/\						
3RD LSA JWG					/\					
4TH LSA JWG						/\				
HANDOFF OF LSA LEAD TO MATERIEL DEV						/\	/\			
LSA STRATEGY (TASK 101)										
DRAFT	/\	/\								
INITIAL APPROVAL		/\								
UPDATES				/\	/\	/\				

AFV LSA MILESTONE CHART

PRODUCT	FY 86	FY 87 1ST QTR	FY 87 2ND QTR	FY 87 3RD QTR	FY 87 4TH QTR	FY 88 1ST QTR	FY 88 2ND QTR	FY 88 3RD QTR	FY 88 4TH QTR	FY 89
		CONCEPT EXPLORATION			ASARC	PROOF OF PRINCIPLE				
LSA PLAN (TASK 102)										
DRAFT		/\		/\						
INITIAL APPROVAL				/\						
UPDATE					/\	/\				
LSA REVIEW (TASK 103)										
1ST REVIEW					/\					
2ND REVIEW						/\				
CONTRACTOR MILESTONES (TBP BY TACOM)										
USE STUDY (TASK 201)										
ASSESSMENT OF O&O				/\	/\					
UPDATE/INITIATE TASK TO SUPPORT ROC					/\					>
STATUS BRIEFINGS					/\	/\				

AFV LSA MILESTONE CHART

ASARC

	CONCEPT EXPLORATION				PROOF OF PRINCIPLE				
	FY 86	FY 87				FY 88			FY 89
PRODUCT		1ST QTR	2ND QTR	3RD QTR	4TH QTR	1ST QTR	2ND QTR	3RD QTR	4TH QTR	
SYSTEM STANDARDIZATION (TASK 202)										
CONSTRAINTS										
LOGC ILS REVIEW		/\								
ASSESSMENT OF O&O				/\	/\					
UPDATE/INITIATE TASK TO SUPPORT ROC					/\	———	———	———	———	>
STATUS BRIEFINGS						/\	/\			
CHARACTERISTICS										
BTA DEVELOPMENT	/\ ———	———	———	———	/\	———	———	———	———	>
STATUS BRIEFINGS					/\	/\				
CONTRACTOR MILESTONES (TBP BY TACOM)										
COMPARATIVE ANALYSIS (TASK 203)										
DRIVERS										
LOGC COMMONALITY STUDY /\ (DEC 85)										
LOGC COMPILE ANALYSES/DRIVERS ... * INCLUDES AFVTF O&S COST DRIVERS BRIEFING, MANPRINT ECAs, AND CEAC SUSTAINMENT COST ANALYSIS REPORT					/\					
STATUS BRIEFINGS					/\	/\				

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AFV LSA MILESTONE CHART

ASARC

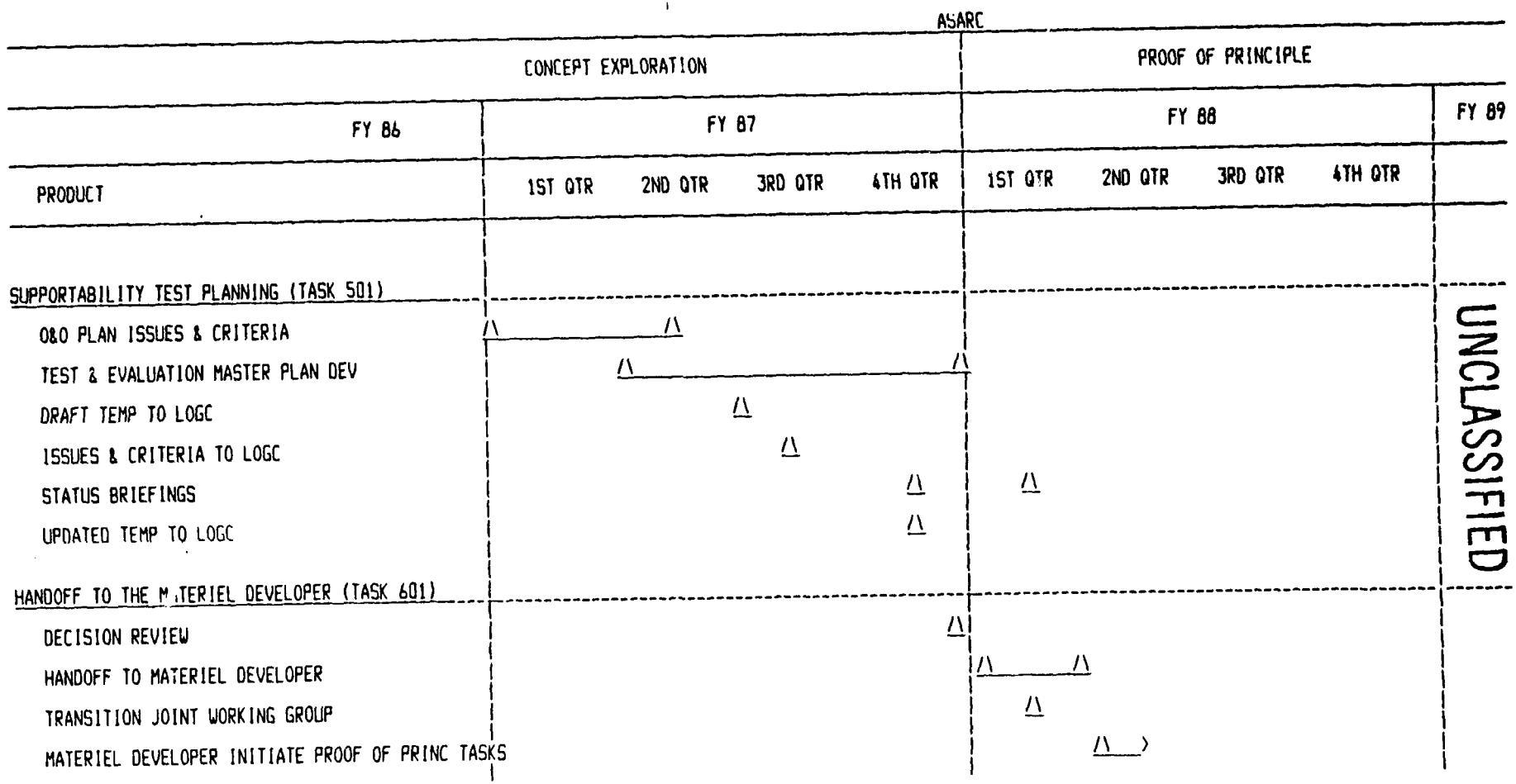
	CONCEPT EXPLORATION				PROOF OF PRINCIPLE				
	FY 86	FY 87				FY 88			FY 89
PRODUCT		1ST QTR	2ND QTR	3RD QTR	4TH QTR	1ST QTR	2ND QTR	3RD QTR	4TH QTR	
COMPARATIVE ANALYSIS (TASK 203)										
SUPPORTABILITY SUB-ANALYSIS										
LOGC SPT ANALYSIS STUDY DIRECTIVE		/\								
LOGC SPT ANALYSIS STUDY PLAN				/\						
ANALYSIS	/\				/\					
DRAFT REPORT					/\					
FINAL REPORT						/\				
STATUS BRIEFINGS					/\		/\			
CONTRACTOR MILESTONES (TBP BY TACOM)										
TECHNOLOGICAL OPPORTUNITIES (TASK 204)										
ASSESSMENTS	/\				/\					
DRAFT RESULTS TO LOGC					/\					
FINAL RESULTS TO LOGC						/\				
STATUS BRIEFINGS					/\		/\			
CONTRACTOR MILESTONES (TBP BY TACOM)										

AFV LSA MILESTONE CHART

ASARC

	CONCEPT EXPLORATION				PROOF OF PRINCIPLE				
	FY 86	FY 87				FY 88			FY 89
PRODUCT		1ST QTR	2ND QTR	3RD QTR	4TH QTR	1ST QTR	2ND QTR	3RD QTR	4TH QTR	
SUPPORTABILITY DESIGN FACTORS (TASK 205)										
AFVTF REVISE ILS PLAN			/\	/\						
ILS PLAN STAFFING				/\	/\					
AFVTF REVISE PLAN					/\	/\				
AFVTF CF FINAL DRAFT TO LOGC						/\				
STATUS BRIEFINGS						/\	/\			
CONTRACTOR MILESTONES (TBP BY TACOM)										
FUNCTIONAL REQUIREMENTS (TASK 301)										
MANPRINT MANAGEMENT PLAN		/\			/\					
MANPRINT EARLY COMPARABILITY ANALYSIS		/\				/\				
STATUS BRIEFINGS						/\	/\			
MANPRINT RESULTS TO LOGC						/\				
CONTRACTOR MILESTONES (TBP BY TACOM)										

AFV LSA MILESTONE CHART



(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) ANNEX B

*7-1-MCL1-005990-101

(U) ANNEX B

(This Annex Is Unclassified)

STUDY PLAN FOR THE

ARMORED FAMILY OF VEHICLES (AFV) SUPPORTABILITY ANALYSIS

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6.j. Measures of Effectiveness (MOE).

6.j.(1). Force Structure MOE.

6.j.(2). Training MOE.

6.j.(3). Supply MOE.

6.j.(4). Maintenance MOE.

6.j.(5). Transportation MOE.

6.j.(6). Support Concept MOE.

6.k. Models.

7. Support and Resource Requirements.

7.a. AFVTE.

7.b. HQ TRADOC.

7.c. LOGC.

7.d. CAC.

7.e. TRAC.

7.f. Schools and Centers.

8. ADMINISTRATION. (Milestones.)

ANNEX A. List of Documents Relevant to AFV.

ANNEX B. Detailed Summary of Force Structure Analysis.

ANNEX C. Detailed Summary of Training Analysis.

ANNEX D. Projected Sources for Data.

STUDY PLAN FOR THE

ARMORED FAMILY OF VEHICLES (AFV) SUPPORTABILITY ANALYSIS

1. PURPOSE OF STUDY.
The purpose of this study is to provide an order of magnitude estimate of the difference in requirements between supporting an armored family of vehicles (AFV) as opposed to supporting armored vehicles projected to be available in the 1996 and 2005 timeframe.

2. REFERENCES. See Annex A.

3. STUDY SPONSOR.

a. HQDA, AFVTF, POC: Ms. Debra Conwell, DAMO-AFV, AUTOVON 927-1466/1465.

b. HQ TRADOC, ATCD, Close Combat, Engineer and Mine Warfare Directorate, POC: Mr. William Jones, ATCD-MH, AUTOVON 680-4417.

4. STUDY AGENCY. USA Logistics Center (LOGC), Operations Analysis Directorate, POC: Mr. Alan Cunningham, ATCL-OOA, AUTOVON 687-5640.

5. STUDY MONITOR. HQ TRADOC Analysis Command (TRAC), Technical Operations Directorate, POC: CPT (P) Ransom Brown, ATRC-TD, AUTOVON 552-5511.

6. TERMS OF REFERENCE.

a. Problem. It is an open question whether an AFV will provide sufficient support effectiveness to justify developing and fielding the next generation of armored vehicles as a family of vehicles rather than continuing the course of separately and independently developing, procuring, and fielding each kind of armored vehicle. The objective of this analysis is to provide an order of magnitude estimate of the theater level (and below) combat service support (CSS) costs or saving that will be realized by implementing the AFV concept .

b. Objectives.

(1) Determine CSS force structure differences resulting from the AFV (Alternative 2) and the improved armored vehicles projected to be available in 2005 (Alternative 1). Alternative 1 and Alternative 2 definitions are discussed below, para 6.h.

(2) Subjectively determine training requirement differences between the AFV (Alternative 2) and the armored vehicles (Alternative 1).

(3) Compare the differences in supply, maintenance, and transportation between the fleet of AFV (Alternative 2) and the armored vehicles as defined in Alternative 1.

c. Scope.

(1) The study will determine the CSS force structure differences for a European theater, by Standard Requirement Code (SRC), between Alternative 1 and Alternative 2. Differences in force structure will be explicit as to types of Military Occupational Specialties (MOSs) required, number of personnel required by MOS, and number of key items of equipment by Line Item Number (LIN) required.

(2) The study will subjectively examine training requirements differences between Alternative 1 and Alternative 2, based on personnel requirements by MOS.

(3) The study will examine differences between Alternative 1 and Alternative 2 in requirements for classes of supply, with particular attention to classes III, VII, and IX.

(4) The study will examine maintenance requirement differences between Alternative 1 and Alternative 2, under current support concepts.

(5) The study will examine transportation requirement differences between Alternative 1 and Alternative 2, in terms of supply vehicles required for the theater.

(6) Airland Battle (ALB) Doctrine will be used as far as possible for Phase I of the study. ALB doctrine cannot be strictly adhered to, due to limitations of the warfighting model which feeds the theater roundout model.

(7) Scenario to be used is that used in the Total Army Analysis 1993 (TAA 93) process.

d. Timeframe.

(1) Base case: 1996.

(2) Alternative 1 and 2: 2005.

e. Constraints. This supportability analysis:

(1) Is only for Phase I of the AFV study.

(2) Will only consider a European theater.

(3) Will not consider the phase in and out of equipment due to introduction of an AFV.

(4) Will not cost the differences of an AFV (Alternative 2) and the armored vehicles of Alternative 1. (The Cost and Economic Analysis Center (CEAC) will do all costing under the direction of the AFV Task Force (AFVTF) in coordination with the LOGC. LOGC will provide CEAC with CSS force modifications. The force differences will be expressed by differences in densities of SRCs of CSS units required to support the combat forces.)

f. Assumptions.

(1) New Concepts Evaluation Model (CEM) warfights will serve as the basis for the logistics force structure analysis (LFSA). Concepts Analysis Agency (CAA) will rerun CEM warfights. If CAA is not capable of rerunning CEM for the alternatives, then modifications will be made to Base Case data for Class VII, Wounded in Action (WIA), and Killed in Action (KIA). Modifications will be based on expert judgement reflecting differences in survivability, combat effectiveness, and system performance characteristics between the alternatives.

(2) Changes in equipment and personnel in the base corps units for the Base Case, Alternative 1 and Alternative 2 will apply to all similar units in the theater. See para 6.h. below for definitions of the base case and alternatives.

(3) All necessary data required for FASTALS will be available when required.

g. Essential Elements of Analysis.

(1) From a theater (and below) perspective, what are the CSS force structure differences between Alternatives 1 and 2 (differences should be defined by MOSs, number of personnel, and key items of equipment)?

(2) For each CSS related MOS identified in EEA 1, what are the differences in training requirements between Alternatives 1 and 2? Differences will be determined by a subjective analysis. Base Case training requirements will not be considered.

(3) What are the changes in supply, maintenance, and transportation requirements needed to support an AFV (Alternative 2) as opposed to the fleet of armored vehicles of Alternative 1?

h. Alternatives.

(1) Base Case: TAA-93 Master (M) (TAA-92 POM Lock) Force for European Theater, as modified to reflect SRCs being used in the Europe 6.5 base corps.

(2) Alternative 1: Base Case force (para 6.h.(1). above) with armored vehicle fleet upgraded to 2005 configuration through product improvements and selective introduction of new armored vehicles as defined by CAC.

(3) Alternative 2: The Alternative 1 theater level force with the armored vehicle fleet replaced with comparable vehicles defined by the AFVTF.

i. Methodology.

(1) General Overview. The methodology is based on the use of the Force Analysis Simulation of Theater Administration and Logistical Support (FASTALS) model in conjunction with the review of the output of combat simulation models, and numerous off-line analyses. FASTALS will be used for a force structure analysis. The primary off-line analysis consists of an examination of a heavy division using automated routines with existing data bases. This analysis will determine CSS requirements for the division under current LOGC support concepts.

As depicted in Figure 1, there are three parts to the methodology, corresponding to the following analyses.

(a) Force structure analysis.

(b) Training analysis.

(c) Analysis of supply, transportation, maintenance, personnel and medical requirements.

(2) Methodology for force structure analysis.

The force structure analysis consists of an echelon above division analysis using FASTALS, and a divisional analysis using automated routines and existing data bases. See Annex B for details of the methodology of the force structure analysis.

(3) Methodology for training analysis.

Differences in training requirements for the alternatives will be based on differences in force structure, based on FASTALS data. See Annex C for details of the methodology of the training analysis.

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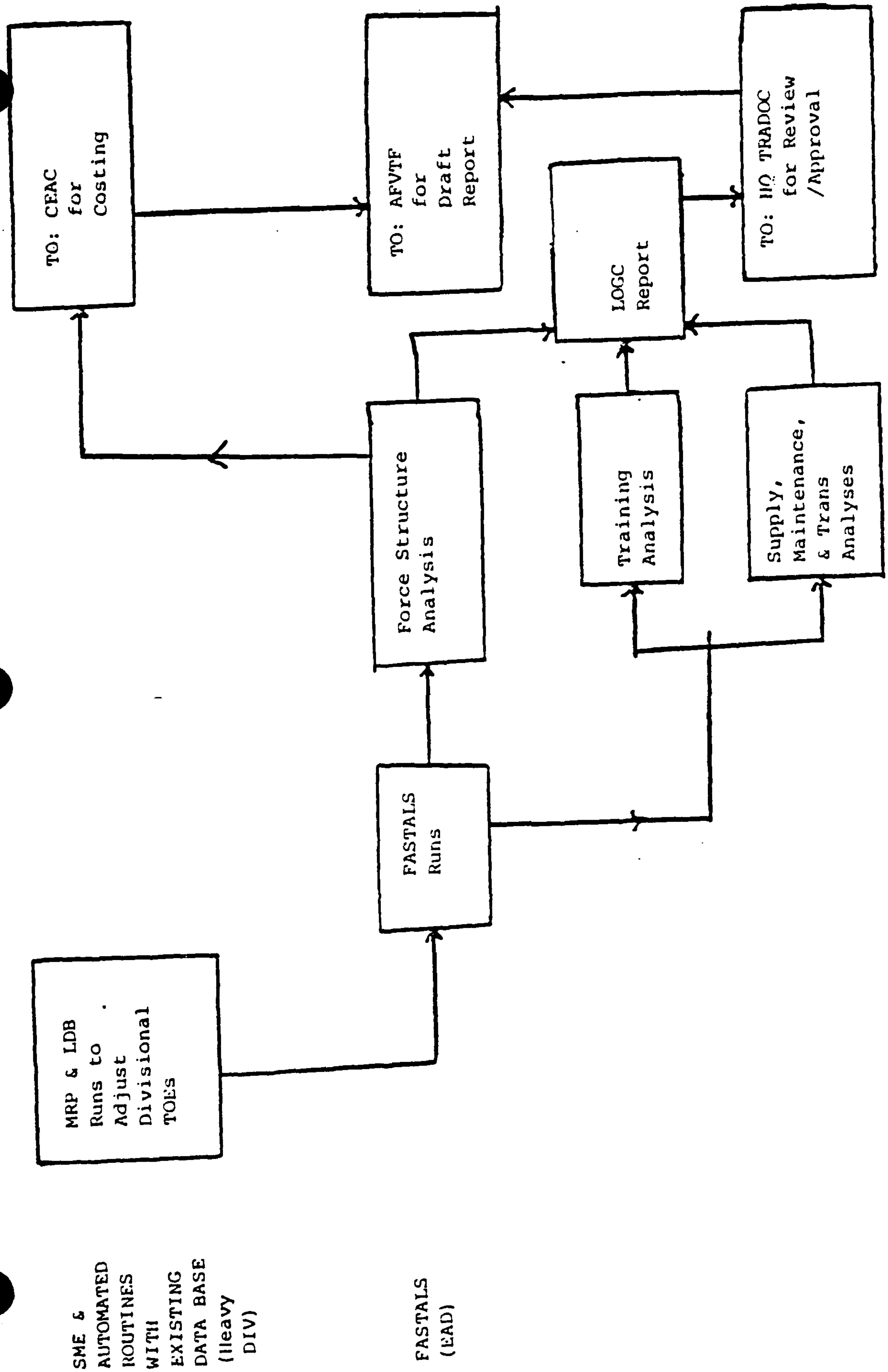

Figure 1

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(4) Classes of supplies review.

Consumption data for all classes of supply are used as input to FASTALS. FASTALS consumption data must be expressed in terms of lbs/man/day for units and unit types. In order to determine the lbs/man/day consumption for Classes III, VII, IX for a specific unit, the consumption for vehicles within the unit must be estimated. After FASTALS has rounded out the combat force for 90 days of conflict, FASTALS will calculate the average daily tonnage required for each class of supply. As such, consumption for the vehicles will be determined for Classes III, VII, and IX (as input to FASTALS). And consumption for the entire theater will be determined for all classes of supply (as output of FASTALS). The AFVTF will coordinate data meetings to obtain data from sources external to TRADOC. Annex D provides a detailed description of projected data sources.

(5) Maintenance review.

As depicted in Figure 2, the maintenance review will consider Annual Maintenance Manhour (AMMH) data required to support the armored vehicles. The maintenance manhour requirements will be used in FASTALS to determine maintenance personnel requirements. If VIC-CSS results are available, they would provide additional information. Specifically, VIC-CSS would provide:

(a) Number of vehicles damaged, by type of vehicle.

(b) Number of vehicles repaired, by type of vehicle.

(c) Average readiness rate of on-hand versus authorized vehicles, by type of vehicle.

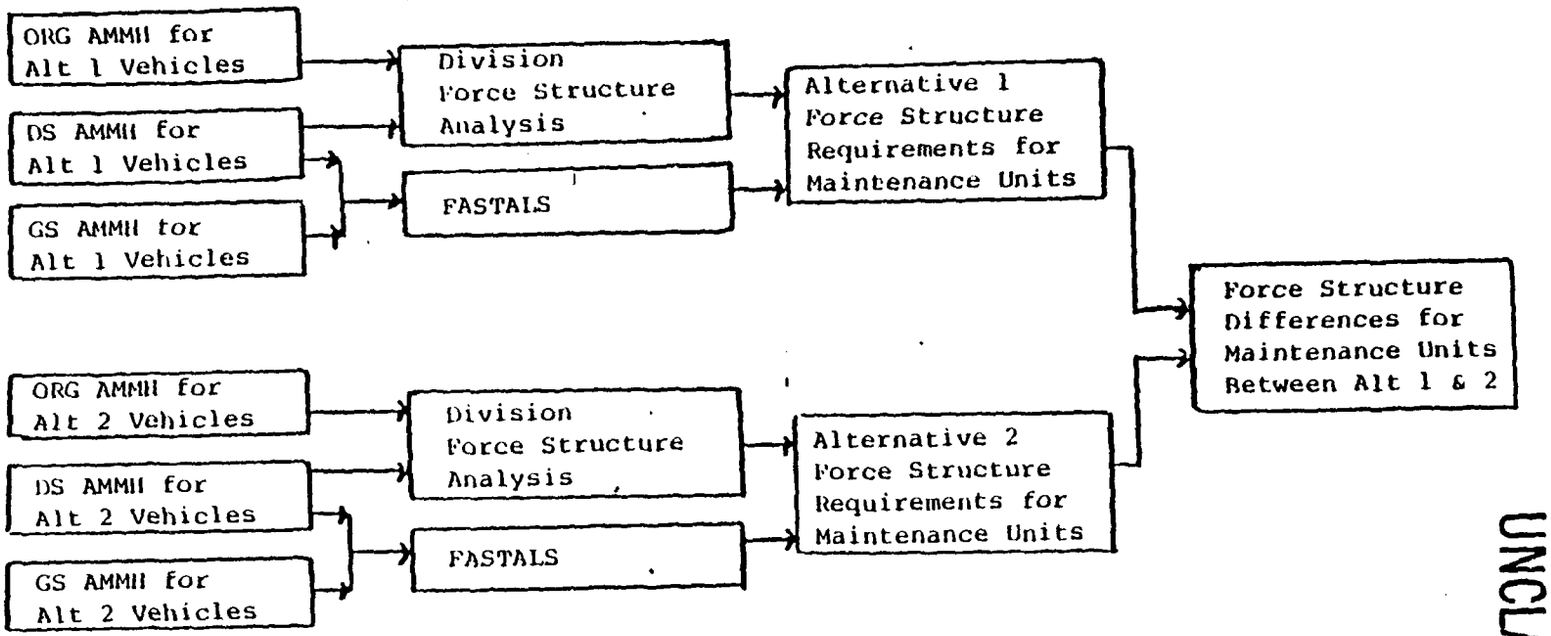
LOGC will coordinate with TRAC-WSMR for specific output needed.

(6) Transportation review.

(a) EAD requirements. Differences in transportation requirements for the two alternatives will be determined by examining results from FASTALS. Differences will include the number of supply vehicles required for the theater for each alternative.

(b) Divisional requirements. Divisional requirements will be determined through automated routines using existing data bases.

THEATER LEVEL ANALYSIS



CORPS LEVEL ANALYSIS

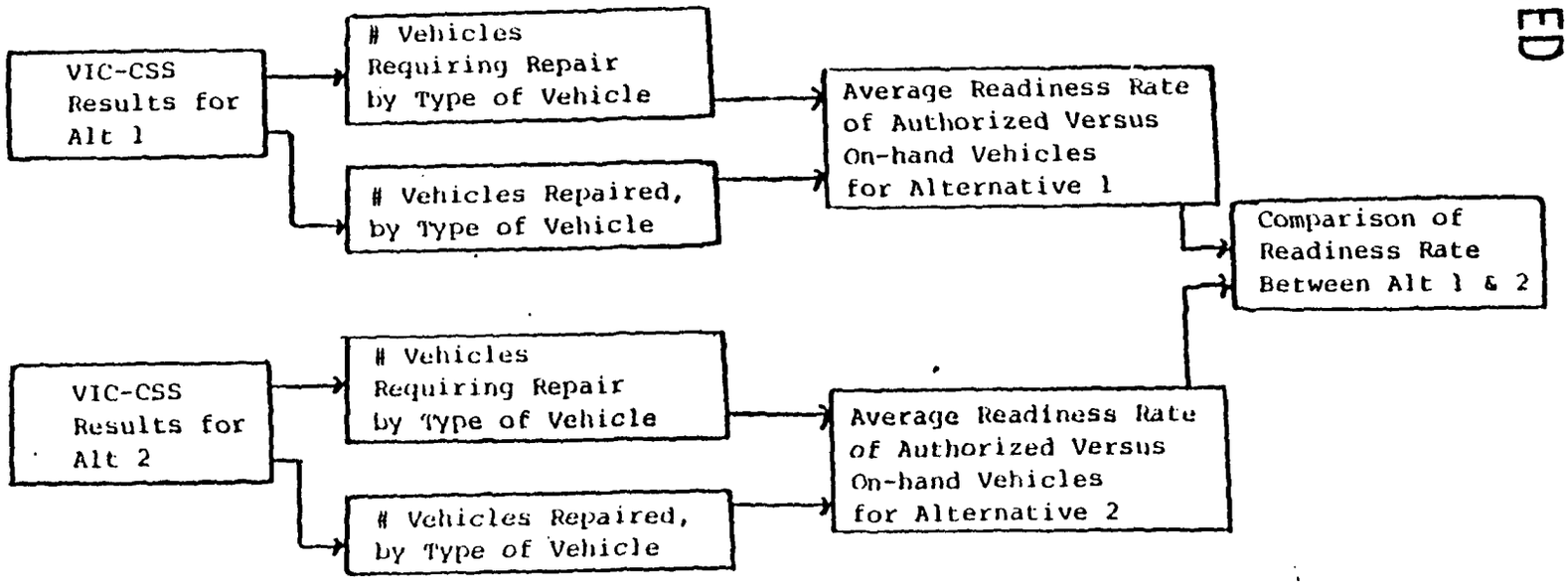


Figure 2

(7) Support Concept Review.

The following subjective reviews will be performed.

(a) A subjective review of the impact of having vehicle operators perform a large amount of unit level maintenance.

(b) A subjective review of the support concept required for a heavy battalion composed of two armor companies and two mechanized infantry companies.

j. Measures of Effectiveness (MOE).

(1) Differences in force structure between Alternative 1 and Alternative 2, to include the following:

(a) Number of personnel for theater by MOS.

(b) Number of major Combat Support (CS) and CSS items of equipment for theater to include:

1 Vehicles.

2 Communication equipment.

3 Weapons.

4 Test equipment.

(2) Subjective estimate of differences in training requirements between Alternative 1 and Alternative 2, to include:

(a) Subjective estimate of changes in length of training.

(b) Subjective estimate of impact of new training resources.

(c) Subjective estimate of impact on facilities.

(3) Differences in supply requirements between Alternative 1 and Alternative 2, to include the following.

(a) Class III requirements to include:

1 Average gallons/day usage for each armored vehicle.

2 Daily consumption rate (in STONs) for the theater.

(b) Class VII requirements to include:

1 Average daily replacement requirement for each armored vehicle.

2 Daily consumption rate (in STONs) for the theater.

(c) Class IX requirements to include:

1 Average daily repair part requirements (in pounds) for each armored vehicle.

2 Daily consumption rate (in STONs) for all Class IX items for the theater.

(4) Differences in maintenance requirements between Alternative 1 and Alternative 2, to include:

(a) Average maintenance manhours (by MOS) required for each armored vehicle.

(b) Average daily maintenance manhours by MOS required for the theater.

(c) If VIC-CSS results are available, corps requirements for the Europe 6.5 scenario will be determined, to include:

1 Number of vehicles repaired, by type of vehicle.

2 Average readiness rate of on-hand versus authorized for vehicles, by type of vehicle.

(5) Differences in transportation requirements between Alternative 1 and Alternative 2, to include the number of supply vehicles required at divisional level and at echelons above division.

(6) Subjective estimate of the following.

(a) The impact of having vehicle operators perform a large amount of unit level maintenance.

(b) The support concept required for a heavy battalion composed of two armor companies and two mechanized infantry companies.

k. Models. FASTALS will be the primary model used in the study. If results from CASTFOREM and VIC-CSS are provided within a sufficiently early time frame, then CASTFOREM and VIC-CSS will also be used.

7. SUPPORT AND RESOURCE REQUIREMENTS.

a. AFVTF.

(1) Coordinate the draft study plan with organizations external to TRADOC.

(2) Manage, coordinate, and integrate the supportability analysis with the costing analysis provided by CEAC.

(3) Schedule General Officer Workshops and In Process Reviews (IPR).

(4) Provide complete definition of EUROPE 6.5 base corps as modified by the introduction of AFV.

(5) At the LIN level of detail, identify the major end item equipment substitutions required to upgrade the FASTALS Master File for Alternative 1 into theater level force for Alternative 2.

(6) Assist LOGC with obtaining data required to run FASTALS for Alternatives 1 and 2. This data includes the following. For each Line Item Number (LIN) which is different from LINs in the base case, information is needed which is sufficient to generate the following FASTALS requirements. (See Annex D for a detailed description of data sources.)

(a) Usage profiles for the vehicles.

(b) Class III consumption for the vehicles for secondary roads, cross country, and idle.

(c) Class V rates, expressed in rounds/tube/day, for each weapon mounted on vehicles.

(d) Class VII replacement rates, expressed as items of equipment/day.

(e) The types of MOSs required to support each vehicle.

(f) Annual Maintenance Manhours (AMMH) by MOS required to support each LIN, categorized by organizational support, intermediate direct support, and intermediate general support.

(g) Identify each Standard Requirement Code (SRC) in the Base Case, such that a LIN in the SRC will be added/replaced with Alternative 1 or Alternative 2 (AFV) equipment. For each SRC, provide the following:

1 LIN to be deleted/added/replaced.

2 Density to be deleted/added/replaced for each LIN.

3 Weight of LIN vehicle which is added/replaced.

4 Deployment weight of SRC.

5 Non-mobile weight of SRC.

6 New personnel strength of SRC.

(7) Provide to the LOGC a knowledgeable member of the AFV Task Force capable of making decisions, and who has approval authority, to be on hand when required during the development, running, and analysis of FASTALS for the Base Case, Alternative 1, and Alternative 2. The AFVTF member will help develop the Table of Organization & Equipments (TOEs) for Alternative 2, and will help analyze FASTALS results.

(8) Assist CAA with rerunning CEM (per guidance by the AFV Sub-SAG) for the Base Case, and Alternatives 1 and 2. If CAA is not capable of rerunning CEM for Alternatives 1 and 2, then CAA, the AFVTF and TRAC will modify Class VII, WIA, and KIA data for the alternatives, based on expert judgement.

(9) Integrate the Supportability Analysis with the Combat Effectiveness Analysis.

b. HQ TRADOC

(1) Issue the study directive.

(2) Review and approve the Study Plan.

(3) Schedule and participate in General Officer Workshops and IPR.

(4) Provide priority and resources at subordinate commands and analysis organizations to facilitate execution of the study.

(5) Approve the final report.

c. LOGC

(1) Prepare Study Plan in accordance with TRADOC REG 11-8, and conduct the study outlined herein.

(2) Coordinate execution of the study with the AFVTF, USACAC, USASSC, USATRAC, and the TRADOC Schools and Centers.

(3) Task TRADOC schools/integrating centers as required to perform this analysis.

(4) Interface with the AFVTF to coordinate support provided by organizations external to TRADOC.

(5) Prepare interim and final analysis reports IAW TRADOC Reg 11-8.

d. US Army Combined Arms Center (USACAC).

(1) Provide force list for base corps as well as complete definition of the base corps as modified by planned 2005 PIPs/selective vehicle introductions.

(2) At the LIN level of detail, identify the major end item equipment substitutions required to upgrade the Base Case theater level force into theater level Alternative 1.

(3) As required, provide functional area expertise to facilitate execution of the supportability analysis.

e. TRADOC Analysis Command (TRAC).

(1) Provide quality control and oversight for the supportability analysis.

(2) Review the USALOGC study plan and make a recommendation to HQ TRADOC for its adequacy in addressing the issues of the analysis.

(3) Coordinate the draft study plan with the AFVTF, USACAC, USASSC, USATRAC, and the TRADOC Schools and Centers.

(4) Review the USALOGC study and make a recommendation to HQ TRADOC for its adequacy in addressing the EEAs.

(5) If CAA is not capable of rerunning CEM for Alternatives 1 and 2, then TRAC will assist the AFVTF and CAA to modify the data.

(6) Provide USALOGC the emerging results from combat simulation models used in the AFV combat effectiveness analysis.

(7) As required, provide functional area expertise to facilitate execution of the supportability analysis.

f. TRADOC Schools and Centers.

(1) Perform proponent functionally related analyses as described herein.

(2) Participate in action officer and general officer workshops and IPR as directed.

8. ADMINISTRATION.

a. Milestone schedule.

	SCHEDULED DATE AS OF SEP 86	COMPLETED /EXPECTED DATE
Issue study directive.	30 Sep 86	13 Dec 86
Definition of Base Case corps.	1 Oct 86	15 Dec 86
Begin definition of theater Base Case force.	6 Oct 86	19 Dec 86
Provide draft study plan to HQ TRAC	31 Oct 86	24 Dec 86
Definition of base corps with 2005 PIPs/selective vehicle introductions.	1 Dec 86	2 Mar 87
Definition of base corps with 2005 AFV vehicle introductions.	1 Dec 86	2 Mar 87
Receive Class III, IX, and AMMH data for running FASTALS for Alternatives 1 & 2.		15 Mar 87
Definition of theater forces with 2005 PIPs /selective vehicle introductions (Alt 1) and AFV (Alt 2).		26 Mar 87

Receive results of CASTFOREM.	NLT TBD
Receive Class VII and WIA data for running FASTALS for Alternatives 1 & 2.	10 Apr 87
Approve study plan	15 Apr 87
Provide CEAC with CSS force structure for LOGC Base Case.	15 Apr 87
Provide CEAC with CSS force structure for Alternative 1.	1 May 87
Provide CEAC with CSS force structure for Alternative 2.	15 May 87
Receive results of VIC-CSS.	NLT TBD
Provide HQ TRADOC & AFVTF with coordinating draft report for Phase I.	30 Jun 87
Provide HQ TRADOC & AFVTF with excursions for Alternative 1.	TBD
Provide HQ TRADOC & AFVTF with excursions for Alternative 2.	TBD
Provide AFVTF with coordinated draft report	13 Aug 87
Publish final report	30 Sep 87

b. Control Procedure. Study will be monitored by GO Workshops and IPR.

c. TRADOC action control number is ACN 073324.

ANNEX A

1. AFV Study Plan, Jul 86.

2. Combat Developments Study Directive: AFV Supportability Subanalysis, Dec 86.

3. Operational and Organizational Plan for the Armored Family of Vehicles, Oct 85.

4. Justification for Major System New Start Armored Family of Vehicles.

5. Defense Science Board 85 Summer Study on Armor/Anti-Armor Competition.

6. Platform Modernization Program Study.

7. DARPA Armor/Anti-Armor Study.

8. DOD and DA Armor/Anti-Armor Master Plans.

9. Combined Arms Mission Area Analysis (CAMAA).

10. Battlefield Development Plans 85 and 86.

11. Soviet Battlefield Development Plan.

12. Total Tank Systems Study.

13. Army Tank Program Analysis Report, Dec 83.

14. Future Armor Combat System - Task Force Report, Apr 84.

15. Special Study Group, Armor Report, Oct 84.

16. Armor Investment Strategy Report, Apr 85

17. Cost Analysis of Common Chassis for Army Tracked Vehicles, Dec 74.

ANNEX B - FORCE STRUCTURE ANALYSIS

1. The force structure analysis consists of an echelon above division analysis using FASTALS, and a divisional analysis using automated routines and existing data bases.

a. Force structure analysis - Echelon above division (EAD).

(1) The CSS force structure analysis for echelons above division will be based on force structure differences resulting from different FASTALS runs. As depicted in Figure B-1, there will be three initial FASTALS runs. These will include:

One FASTALS run for the Base Case to calibrate a Base Case force.

One FASTALS run for Alternative 1, resulting in an expected CSS force for Alternative 1, using a new CEM warfight.

One FASTALS run for Alternative 2, resulting in an expected CSS force for Alternative 2, using a new CEM warfight.

As depicted in Figure B-1, if Concepts Analysis Agency (CAA) does not provide the LOGC with new CEM results for Alternatives 1 and 2, then new Class VII, WIA, and KIA data will be estimated by the AFVTF with assistance from CAA and TRAC. The new data will be based on "best estimates" of warfighting capability differences between Alternative 1 vehicles, Alternative 2 vehicles, and Base Case vehicles.

(2) The following excursions will be run as addenda to the final report.

Two FASTALS runs for Alternative 1 which use high and low estimates for salient input data, resulting in two extra CSS forces for Alternative 1.

Two FASTALS runs for Alternative 2 which use high and low estimates for salient input data, resulting in two CSS extra forces for Alternative 2.

The initial FASTALS runs and the excursions are depicted in Figure B-2. By running two excursions for Alternative 1, along with a FASTALS run for an expected CSS force for Alternative 1, a heuristically derived range would be estimated for the overall Alternative 1 force structure. A similar design would be followed for Alternative 2.

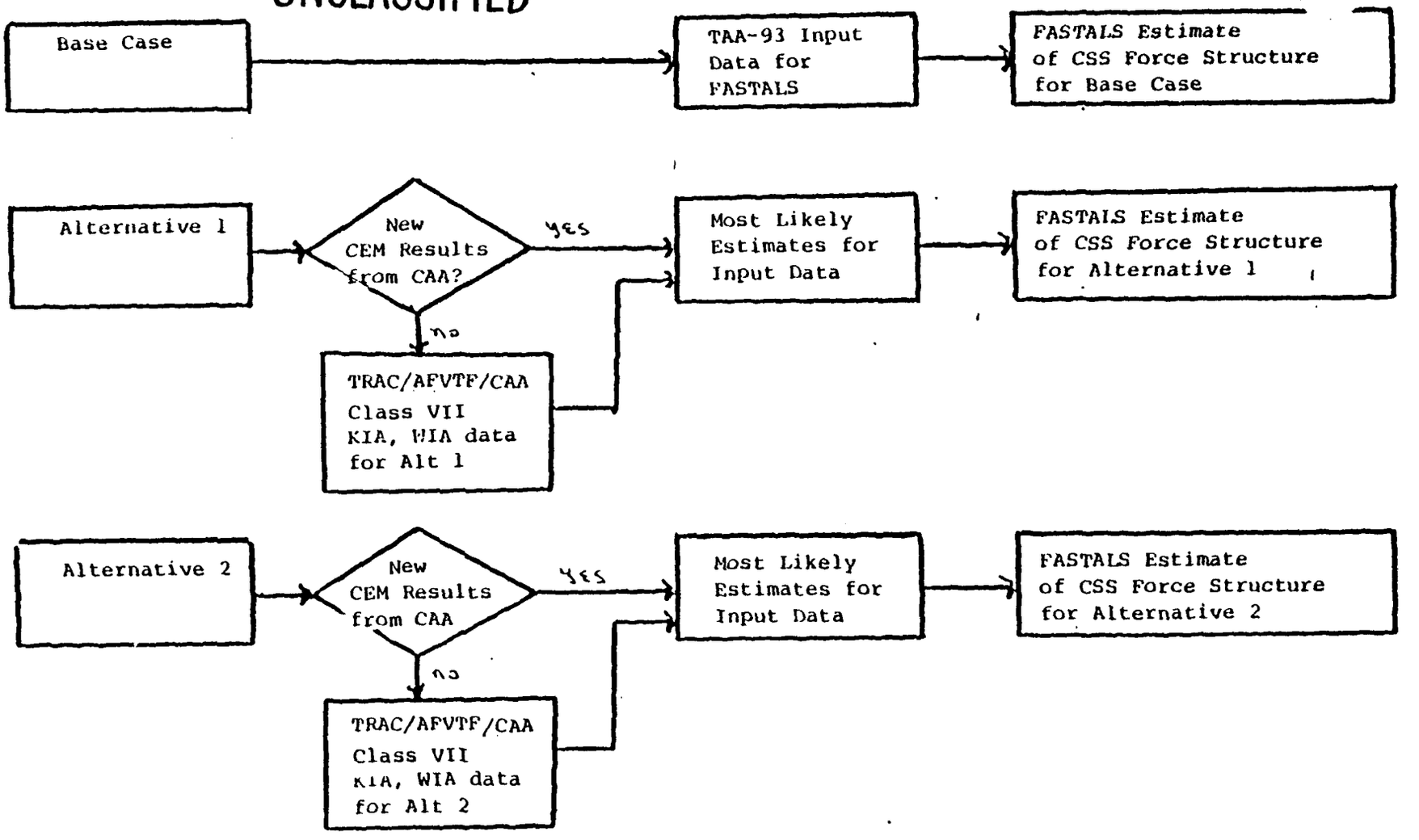

Base Case
TAA-93 Input Data for FASTALS
FASTALS Estimate of CSS Force Structure for Base Case
Alternative 1
New CEM Results from CAA?
yes
no
Most Likely Estimates for Input Data
FASTALS Estimate of CSS Force Structure for Alternative 1
TRAC/AFVTF/CAA Class VII KIA, WIA data for Alt 1
Alternative 2
New CEM Results from CAA
yes
no
Most Likely Estimates for Input Data
FASTALS Estimate of CSS Force Structure for Alternative 2
TRAC/AFVTF/CAA Class VII KIA, WIA data for Alt 2

Figure B-1

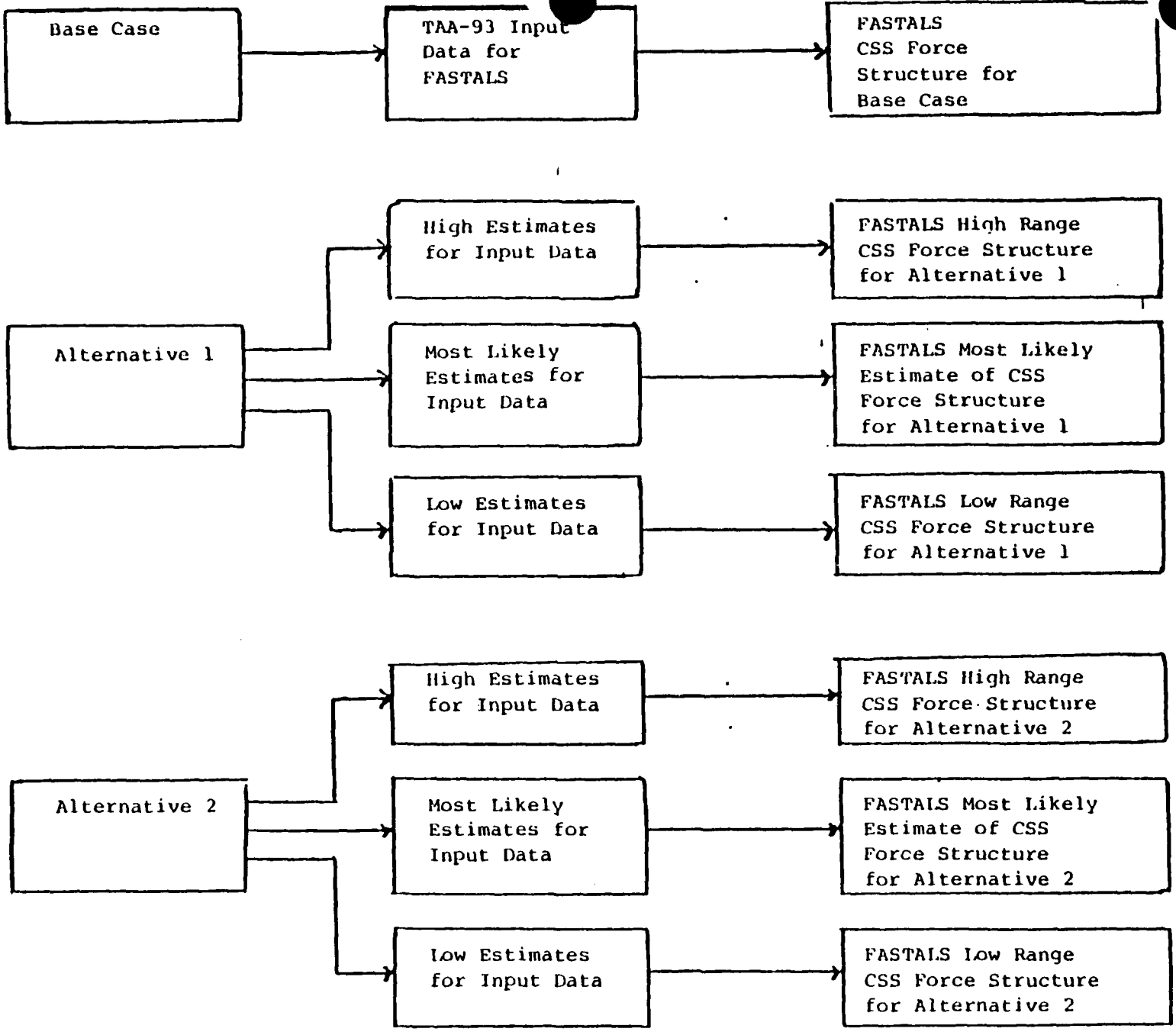

Base Case
TAA-93 Input Data for FASTALS
FASTALS CSS Force Structure for Base Case
Alternative 1
High Estimates for Input Data
FASTALS High Range CSS Force Structure for Alternative 1
Most Likely Estimates for Input Data
FASTALS Most Likely Estimate of CSS Force Structure for Alternative 1
Low Estimates for Input Data
FASTALS Low Range CSS Force Structure for Alternative 1
Alternative 2
High Estimates for Input Data
FASTALS High Range CSS Force Structure for Alternative 2
Most Likely Estimates for Input Data
FASTAIS Most Likely Estimate of CSS Force Structure for Alternative 2
Low Estimates for Input Data
FASTALS Low Range CSS Force Structure for Alternative 2

Figure B-2

Number of Personnel in Theater

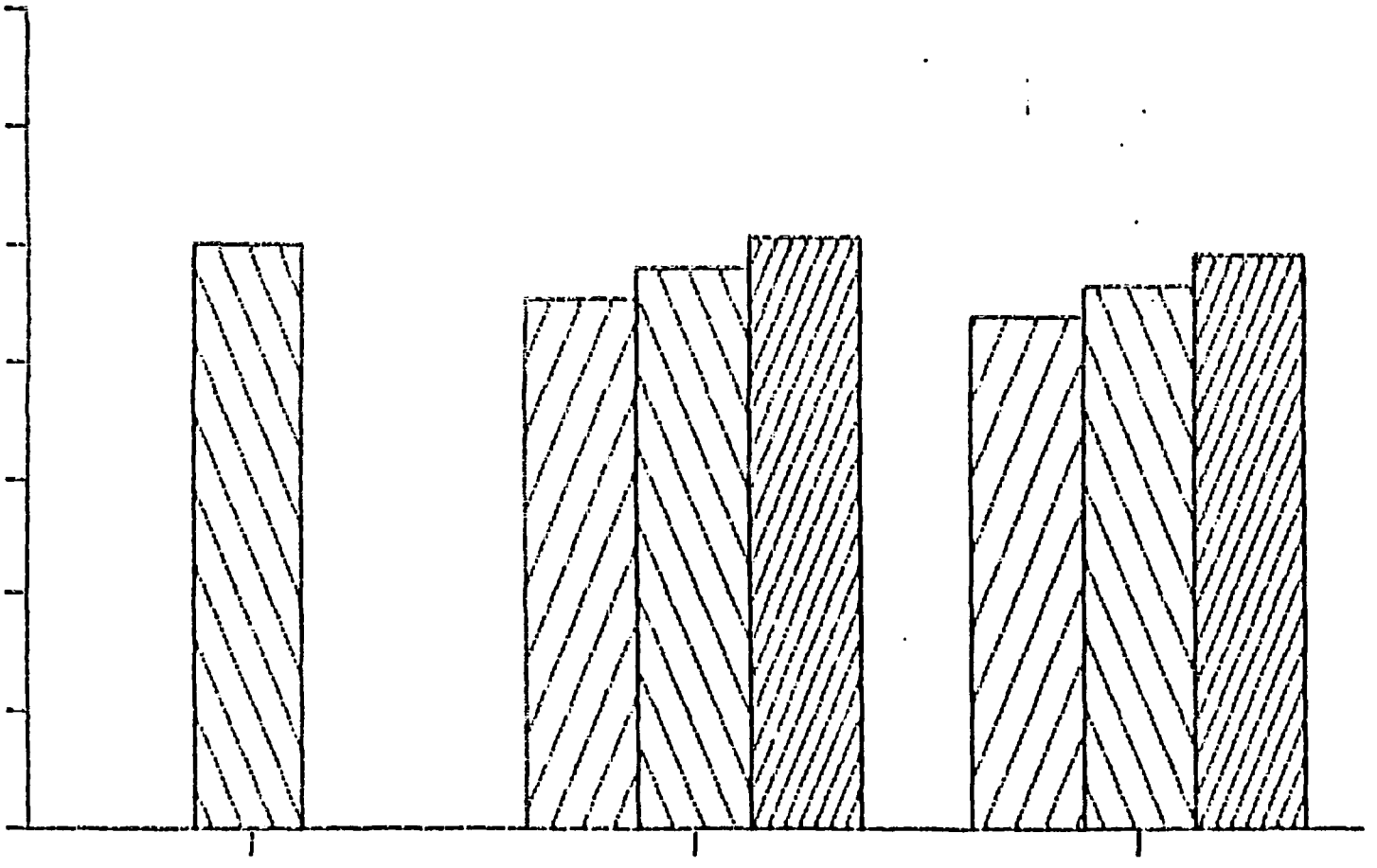


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Figure B-3

(3) Force structure changes can be measured using various criteria. E.g., total personnel for the theater, personnel for the communication zone, personnel by MOS, number of 2 1/2 Ton trucks for the theater, number of 5 Ton trucks for the theater, etc. For each criterion deemed appropriate, results for the Base Case and the ranges for Alternatives 1 and 2 can be depicted with bar charts. An example for the total population of the theater is depicted in Figure B-3.

(7) As depicted in Table B-1, there will be three FASTALS runs in the main analysis. An additional four excursions will be made, for a total of seven FASTALS runs.

(b) Force structure analysis - Divisional units.

(1) A heavy division will be examined, using automated routines accessing existing data bases, with the support concepts under Airland Battle doctrine. Features to be examined include:

Annual maintenance manhours (AMMH) required to support the Alternative 2 (AFV) vehicles as opposed to the AMMH required to support the Alternative 1 vehicles within the brigade and its division slice.

Fuel requirements for the Alternative 2 (AFV) vehicles and the Alternative 1 vehicles within the brigade and its division slice.

Personnel differences for the division with Alternative 2 (AFV) vehicles as opposed to the division with Alternative 1 vehicles; Differences in equipment requirements to support the personnel.

	Most Likely Estimate for All Relevant Input Data		Low Estimate for Relevant-Input Data		High Estimate for All Relevant Input Data
BASE CASE	X				
ALTERNATIVE 1	X		X		X
ALTERNATIVE 2	X		X		X

FASTALS MAIN ANALYSIS

FASTALS EXCURSIONS (ASSUMING SUFFICIENT TIME TO RUN EXCURSIONS)

TOTAL NUMBER OF R[redacted] = 7

Table B-1

ANNEX C - TRAINING ANALYSIS

1. New and improved weapon and support systems will bring new and innovative technology to the battlefield. With this technology comes the need for different skills to operate and maintain these systems. The objective is to develop and perform a training analysis that will provide a subjective estimate of the differences in training requirements for Alternatives 1 and 2. It will estimate training impacts due to personnel changes (by MOS) between Alternatives 1 and 2, which are implicit in the FASTALS results.

Assumptions:

a. The study will encompass Compo 1, 2, 3, and 4 (FASTALS is not able to subdivide the force structure).

b. Current equipment and personnel requirements documented by TOE are valid. This limits the analysis to the support requirements of identified systems rather than an analysis of the need for various systems.

c. For Phase I, the AFV will be supported under the current maintenance concept.

2. Methodology.

The training analysis will determine differences in training requirements for Alternatives 1 and 2 based on a subjective analysis of FASTALS data, focusing primarily on ORD MOSs. The subjective analysis will key on:

a. Changes in types of MOSs.

b. Changes in number of personnel by MOS.

c. Subjective estimate of changes in length of training.

d. Subjective estimate of impact of new training resources.

e. Subjective estimate of impact on facilities.

ANNEX D - PROJECTED SOURCES OF DATA

(This Annex Is Unclassified)

1. Usage profiles, consumption data for classes III, VII, IX, Annual Maintenance Manhour (AMMH) data, and combat related data will be obtained from the following sources.

a. Wartime usage profiles (hours/day spend on secondary roads, cross-country, and idle) for each Alternative 1 and 2 vehicle will be the usage profile used for a similar vehicle in the Total Army Analysis 1993 (TAA-93) process. THE AFVTF will determine which vehicle from the TAA-93 process is most like an Alternative 1 and Alternative 2 vehicle. The same Base Case profile will be used for the counterpart vehicles in Alternatives 1 and 2.

b. Class III consumption data (expressed in gallons/hour for the usage profiles) for each Alternative 1 and 2 vehicle will be provided by TACOM. TACOM will estimate the consumption requirements through subject matter experts from TACOM, the AFVTF, and LOGC, at a meeting at TACOM.

c. Class V rates for Alternatives 1 and 2 will remain the same as the Base Case rates. I.e., Class V rates (expressed as lbs/day) for Alternative 1 and 2 units will be the rates used for the Base Case units. These rates will be converted to lbs/man/day for Alternative 1 and 2 units.

d. Class VII consumption data (expressed as vehicles/day) for each Alternative 1 and 2 vehicle will be estimated at a meeting set up by the AFVTF. Subject matter experts will include representatives from the AFVTF, AMSAA, BRL, CAA, CACDA, LOGC, and TRAC. If CAA is able to rerun CEM for the alternatives, then the CEM results will be used in Sequence 37A. (Sequence 39A includes attrition totals for tanks and lightly armored vehicles for the theater by time period). If CAA is not able to rerun CEM, then the LOGC will modify the Sequence 37A data based on the new Class VII replacement rates.

e. Class IX consumption data (expressed in STONs/year for repair parts) for each Alternative 1 and 2 vehicle will be provided by TACOM. TACOM will estimate the consumption requirements through subject matter experts from TACOM, the AFVTF, and LOGC, at a meeting at TACOM.

f. Annual Maintenance Manhour data (expressed in manhour/year by MOS) for each Alternative 1 and 2 vehicle will be provided by TACOM. TACOM will estimate the manhour requirements through subject matter experts from TACOM, the AFVTF, and LOGC, at a meeting at TACOM.

g. If CAA is able to rerun CEM for Alternatives 1 and 2, then CEM will provide new totals for wounded in action (WIA), casualties, and killed in action (KIA) for the theater (by time period). This data is used in Sequence 37A of FASTALS. If CAA is not able to rerun CEM, then new WIA, casualties, and KIA totals will be estimated at the Class VII meeting set up by the AFVTF.

(U) ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

(U) TRANSPORTABILITY

DEPARTMENT OF THE ARMY
MILITARY TRAFFIC MANAGEMENT COMMAND
TRANSPORTATION ENGINEERING AGENCY
12388 WARWICK BOULEVARD, P.O. BOX 6276
NEWPORT NEWS, VIRGINIA 23606-0276

REPLY TO
ATTENTION OF:

July 10, 1987

Operations Analysis Division

Major General R. J. Sunell
Director of Armored Family
of Vehicles Task Force
Fort Eustis, VA 23604

Dear General Sunell,

As requested by your staff, and in accordance with AR 70-47, we have completed a unit deployment assessment of the Armored Family of Vehicles (AFV) (Enclosure 1). It should be considered a first draft in that new airlift planning factors, just made available to us, may change our air sortie estimates somewhat. However, the results of the rest of the document will not be affected. The assessment results show that the AFV will significantly increase all transportability measures such as STON and square feet. I am very concerned by these increases, since they could hinder our ability to deploy forces rapidly. The comment by General Thurman (Enclosure 2) indicates a high level of interest in this arena.

Hopefully, action can and will be taken to address this growth. For example, a width change of six inches or an ability to reduce width by six inches for the small chassis would greatly increase C-141B eligibility. If, after further examination, changes are not readily possible, then I think it essential that top Army leadership be made aware of the potential significant negative impact of AFV on strategic mobility so that timely compensating actions can be developed.

A follow-on assessment will be provided within the next 30 days addressing any changes in the airlift sorties caused by the new planning factors. A copy of this letter is being provided Commander, Military Traffic Management Command, ATTN: MT-C and MT-SA and to Commander, U. S. Army Tank Automotive Command, ATTN: DPEO (Close Combat Vehicles). We will continue to work

closely with your staff on this action. My point of contact is Mr. Roy D. Rogers, Chief, Operations Analysis Division, AUTOVON 927-5266.

Sincerely,

EDWARD B. ENGLISH
Colonel, TC
Commanding

Enclosures

ARMORED FAMILY OF VEHICLES

(U) PRELIMINARY UNIT DEPLOYMENT ASSESSMENT

(This Section Is Unclassified)

10 June 1987

TRANSPORTABILITY

1. The preliminary transportability study of the AFV was conducted, at the Task Force's request, by the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA). This study (Appendix 1) compares the Armored Division (TOE87000J430) in present and AFV form. The information was provided to MTMCTEA by Tank Automotive Command (TACOM) and the Task Force (Appendix 2). The MTMCTEA study concludes that with few exceptions the AFV vehicles are both larger and heavier than the vehicles being replaced. There is an increase of more than 144,000 square feet, a 42% to 52% increase in short tons, a 16% increase in measurement tons (cube) and a 93% increase in the number of vehicles requiring C-5 or C-17 transport. However, these increases in the AFV family weight and cube must be viewed in the context of their impact on varying modes of transportation. The increase in deployment requirements amounts to one more Fast Sealift Ship (FSS) in the maritime mode. In the airlift mode an additional 453 C-5/C-17 sorties are required using the wartime load factors. This is accompanied by a reduction of 445 C141B sorties. Rail transport shows all of the AFV vehicles requiring special routing and scheduling in Europe. CONUS rail use will be little effected other than increased use and need for the DODX 68 foot 140 ton flatcar. All AFV vehicles will have to use the HET for road travel.

2. The true impact of these increases must be measured against the assets available and the usage rate of these assets by the present vehicles. In the sealift mode the present armored division requires nine FSS to deploy. The AFV division will require ten FSS to deploy. There are presently 191 ships capable of handling vehicles 55 tons or less. This would give the Army enough assets to move 19 AFV armored divisions. If the present division receives M1A1 Block II at more than 67 tons the number of ships capable of handling vehicles of that weight is reduced to 81. The available assets could then lift only 9 divisions.

3. The study concludes that armored divisions will not be moved by airlift and therefore the increase in C-5/C-17 sorties is a moot point. This is true when one considers units as large as a division. The airlift of smaller units however is still feasible and needs comparison. A battalion of M1A1 Block II tanks, with a combat weight of 134,000 lbs, would require 58 C-5B sorties. The AFV battalion with FV-1, at a vehicle weight of 110,000lbs, would require only 29 C-5B sorties since two of these vehicles would not exceed the maximum wartime load for the aircraft. The present force also is not as C141B deployable as it would appear. The M2/3 needs depot level modification to be made C141B deployable and this limitation will grow when the high survivable series of these vehicles enter the force.

4. This study (Appendix 1) was conducted within guidelines that were dictated by the constraints of available information and time. The first guideline was the need to complete the study by 1 June which limited MTMCTEA to a comparison study of the armored division (TOE 87000J430) in present and AFV form. The only information on the AFV subsystems that was presently available was the conceptual drawings and figures provided by the Tank and Automotive Command (TACOM) for the Task Force generic BTA. This information was provided to MTMCTEA (Appendix 2) as well as proposed AFV TOE substitutions of AFV

subsystems for current use vehicles (Appendix 3). This study was based on the knowledge that most of the information on sizes, shapes, and in some cases weights, was purely conceptual. The preliminary engineering transportability study of each subsystem in AFV is even more constrained by these same limitations. All data used was based on the TACOM conceptual AFV system. This information is based on a detailed study but does not represent the concepts of the three competing contractor consortiums.

5. The study considered air, rail, and sealift modes of transportation. The study examines only the aspects of transportability and does not attempt to evaluate relative combat power, survivability, lethality, or commonality improvements between AFV and the present systems considered for replacement. Combat effectiveness evaluations are not conducted by MTMCTEA but should be considered with the results or the reader could falsely assume that the trade-off is purely in size and dimension and does not include a significant advance in the total force combat power. This cannot be over emphasized since all aspects of the force design involve trade-offs in which gains in certain areas are bought by acceptable penalties in other areas.

6. The threat of the next century battlefield has necessitated the overall growth in size and weight of the AFV family. The transportation to the battlefield of a lighter, non-survivable, force would be futile and wasteful of resources, the most important being our soldiers. If the force cannot win then it should not be deployed no matter how logistically attractive it may be. The British experience in the Falklands raises one glaring example. The lack of a true aircraft carrier almost doomed the entire expedition. An increase in air refueling assets in the Argentine Air Force would have driven the fleet from the Islands. The cost savings of scrapping the only real carrier in their Navy almost lost the British the war and did account for the loss of at least five major ships. The force must be capable of winning once its arrives at its destination. All else is of a secondary importance. The price of one extra ship to lift the Armored Division is a small price to pay for success.

7. The Task Force will pursue a Best Technical Approach (BTA) which holds to the weight and size parameters stated above. The 55 ton weight cap must be observed and all of the engineering subsystems must be capable of reducing system width to that of the heavy chassis (144"). If this is done a majority of the transportation pitfalls will be avoided.

1. Background.

a. The Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) is conducting unit deployment assessements of new equipment item(s) during concept development. These assessments are conducted in accordance with AR 70-47, Engineering for Transportability, in order to provide decision makers information concerning the impact of developmental items on deployment requirements. When these assessments are completed early in the acquisition cycle, issues concerning deployment can be addressed before they become major problems.

b. At the request of the Armored Family of Vehicles Task Force (AFVTF), Fort Eustis, VA, MTMCTEA agreed to perform a unit deployment assessment of the Armored Family of Vehicles (AFV) based on data provided by the AFVTF. Because the AFV is at an early stage of development in the Accelerated System Aquisition Process, this is a preliminary assessment. MTMCTEA plans to perform at least one more assessment of the AFV before the Milestone I ASARC scheduled for late 1989.

2. Methodology Objective. The object of the assessment methodology is to compare a unit/force as it is equipped under US Army Training and Doctrine Command's (TRADOC) TOE authorization to the unit/force after it has been modified with new equipment substitutions. This provides "before and after" pictures which are used to evaluate the effects of the new equipment on unit deployability.

3. Data Sources. The "before and after" pictures used to evaluate the AFV were developed using the Armored Division (TOE 87000J430). Equipment authorizations for the Armored Division were taken from the TRADOC Master TOE file, dated October 1986. Dimensions and weight data came from the COMPASS Equipment Characteristics File (ECF), dated January 1987. AFV dimension and weight data were provided by the Tank Automotive Command (TACOM) and the AFVTF. Equipment additions and deletions for the AFV substitutions into the Armored Division were provided by the AFVTF.

4. Armored Family of Vehicles.

a. The proposed AFV currently consists of 32 different types of full-tracked armored vehicles to be built on two standardized chassis. The vehicle weights are expected to have a critical effect on transportability. Since the estimates of those weights are continually changing, three alternatives of the AFV were substituted into the Armored Division (table 1):

(1) Alternative 1 - all AFV vehicle weights equal to or less than 55 tons (Weight estimates provided by the AFVTF).

(2) Alternative 2 - all AFV vehicle weights less than 64 tons (Revised weight estimates provided by TACOM and the AFVTF).

(3) Alternative 3 - selected AFV vehicle weights equal to 65 tons (65 ton weights selected by MTMCTEA (MTT-TR) as a worst case estimate).

The equipment quantities deleted from the base case Armored Division remained the same for each alternative (table 2).

b. Transportability growth measures (square feet, short tons, measurement tons, number of vehicles, number of C-5/C-17 required items) and airlift and sealift requirements were generated for the base case Armored Division and the three alternatives (table 3). C-141B, C-5, and C-17 airlift requirements were generated using TEA's Air Load Model (ALM). Allowable cabin loads (ACLs) for the C-141B and C-5 aircraft were taken from AFR 76-2 (C1), 17 February 1982. C-17 ACLs were based on estimates provided by McDonnell-Douglas Corporation. Sealift requirements were developed using only Fast Sealift Ships (FSS). Usable square footage for the FSS was based on a 75 percent stow as shown in table 4.

5. Impact on Unit Deployability.

a. As shown in table 3 and graphically illustrated in chart 1, the AFV will heavy up the Armored Division on a massive scale. Of the five transportability measures, all but the number of vehicles show a dramatic increase.

(1) There is an increase of more than 144,000 square feet, roughly equivalent to the usable space of one FSS.

(2) Short ton increases range from 42.5 to 52.4 percent.

(3) Measurement tons increase 16.4 percent.

(4) Items requiring either C-5 or C-17 transport increase 92.9 percent.

These massive increases are the direct result of the standardized two chassis design concept. Each of the proposed AFV vehicles will be a full-tracked armored vehicle that will either require a C-5 or C-17 for air transport. With few exceptions, the proposed vehicles are both larger and heavier than the vehicles they replace.

b. The increased size and weight of the Armored Division result in a corresponding increase in deployment requirements.

(1) Sealift.

(a) Currently the Armored Division can be deployed using 8.6 (nine) FSS. With the AFV it will require 9.6 (ten) FSS (table 3). A significant point in this sealift increase is the fact that, of the cargo ships in the US flag fleet, only the eight existing FSS have endurance speeds of 27 knots.

(b) Increase in the overall weight of the division is not a factor in the number of ships required to deploy. This is reflected in the fact that all three alternatives require the same number of ships (table 3). However, individual vehicle weights are a factor in deployment by sea. Load limits on ramps or decks or lift capacity of cranes may preclude the loading of heavy armored vehicles on a particular ship.

(2) Airlift. The Armored Division is not intended to be deployed primarily by air. However, specific peacekeeping, combat, or resupply scenarios could require limited air deployment. Each of the 32 new types of vehicles in the AFV

requires either a C-5 or C-17 aircraft for air transport. Therefore, emergency air movement of either part or all of the Armored Division will depend entirely on the availability of C-5 or C-17 aircraft. Currently there are 77 C-5s in the Military Airlift Command inventory, with another 50 under construction. Two hundred ten C-17s are planned for the future (initial receipts 1992). The ramp limit for the C-5 aircraft is 129,000 pounds. Alternative 3 (table 3) shows that there are at least 549 equipment items in the proposed Armored Division with the potential to exceed the C-5 ramp limit.

(3) Rail Movement.

(a) All of the vehicles in the proposed AFV exceed the limitations of the NATO envelopes for European rail clearances. Movement by rail will be restricted to special routings and times, using special railcars. The vehicles built on the 117-inch-wide medium chassis will be less restricted than those built on the heavy 144-inch-wide chassis. The German railroad currently restricts north-south rail movement of the M1 tank (137 inches wide) to one main rail line. There are four types of proposed AFV vehicles that will have bulldozer blades or rollers up to 164 inches wide. These include the FV-3 SAPPER, FV-11 Combat Mobility Vehicle, FV-11 Combat Earth Mover, and the FV-11 Combat Excavator. If these vehicles cannot be reduced to 144 inches wide with a minimum of time and effort, they could seriously hamper the already limited ability to move by rail in Europe.

(b) CONUS rail clearances are much less critical than those in Europe. Medium chassis vehicles will have virtually unrestricted CONUS rail movement. Restrictions on the heavy chassis vehicles will have the same impact on the ability to deploy by rail as the M60 and M1 tanks. This is, again, assuming that the heavy vehicles can be reduced to the width of the chassis with a minimum of dissassembly. Increased vehicle weights, however, will increase the reliance on the DODX 68-foot, 140-ton flatcar for CONUS rail movement. There are presently 569 such flatcars in the inventory with proposals to build another 150. These flatcars were specifically designed and built to carry two M1 tanks because of the nonavailability of satisfactory railcars capable of transporting two tanks as large and heavy as the M1.

6. Item Transportability. A detailed analysis of the transportability of individual AFV vehicles is included in the Preliminary Transportability Engineering Analysis of the Armored Family of Vehicles. Particular emphasis is placed on specific transportability problems caused by increasing vehicle weights.

7. Conclusions.

a. Current AFV protype design characteristics represent serious degradation of the strategic mobility of the US Army.

b. AFV equipment proposed design characteristics are contrary to:

(1) The spirit of General Thurman's statement that "Our notion is, gee whiz, let's get the Navy to drive up six more ships, get the Air Force to drive up another 10 airplanes and we'll somehow get all that stuff deployed. We can't affort it. We have to think small."

(2) Current TRADOC efforts to reduce or, at least not increase, unit deployment requirements.

(3) US Army Materiel Command's (AMC) concern to downsize equipment for improved transportability.

8. Recommendation. There is need for an immediate review by US Army leadership of the AFV to ensure that development of AFV proceeds with full cognizance of this potential degradation to the strategic deployment of the US Army.

TABLE 1

EQUIPMENT ADDITIONS TO THE ARMORED DIVISION

	LIN-INDEX	NOMENCLATURE		AUTHORIZED QUANTITY	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	ALTERNATIVE WEIGHTS (LB)* <-- 1	2	3 -->
	A01870 01	ACCESSORY KIT	MK-1259/G	48	18.3	11.0	8.5	15	15	15
**	Z99901 01	FV-1 FUTURE ARMORED COMBAT SYSTEM	(FACS)	348	372.0	144.0	116.0	110000	117600	130000
	Z99902 01	FV-2 INFANTRY FIGHTING VEHICLE	(IFV)	224	288.0	144.0	118.0	90000	104600	104600
	Z99902 02	FV-2 CAVALRY FIGHTING VEHICLE	(CFV)	98	288.0	144.0	118.0	90000	106000	106000
	Z99902 03	FV-2 SAPPER		36	288.0	144.0	102.0	100000	113400	113400
	Z99902 04	FV-2 FIRE SUPPORT VEHICLE	(FIST-V)	47	291.0	144.0	101.0	100000	103800	103800
	Z99902 05	FV-2 DIRECTED ENERGY WEAPON	(DEW)	8	288.0	144.0	101.0	90000	110000	110000
	Z99902 06	FV-2 AMBULANCE		83	288.0	144.0	114.0	90000	97600	97600
	Z99902 07	FV-2 COMMAND GROUP VEHICLE	(CMDGP)	61	288.0	144.0	114.0	90000	97600	97600
	Z99903 01	FV-3 LINE OF SIGHT ANTI-TANK	(LOS AT)	32	298.0	144.0	100.0	90000	103600	103600
	Z99903 02	FV-3 LINE OF SIGHT AIR DEFENSE	(LOS AD)	36	298.0	144.0	100.0	100000	103600	103600
	Z99904 01	FV-4 NON-LINE OF SIGHT AIR DEFENSE	(NLOS AD)	18	282.0	117.0	113.0	70000	60000	60000
	Z99904 02	FV-4 NON-LINE OF SIGHT ANTI-TANK	(NLOS AT)	16	282.0	117.0	113.0	70000	66600	66600
**	Z99905 01	FV-5 HOWITZER 155MM		72	446.0	144.0	115.0	90000	111800	130000
	Z99906 01	FV-6 MULTIPLE LAUNCH ROCKET SYSTEM	(MLRS)	9	282.0	117.0	113.0	70000	70000	70000
	Z99907 01	FV-7 FORWARD AREA REARMAMENTS VEHICLE	(FARV REARM)	167	282.0	117.0	113.0	70000	69000	69000
	Z99907 02	FV-7 FORWARD AREA REFUELING VEHICLE	(FARV REFUEL)	67	282.0	117.0	113.0	70000	69000	69000
	Z99907 03	FV-7 FORWARD AREA RESUPPLY VEHICLE	(FARV RESUPPLY)	38	282.0	117.0	113.0	70000	64800	64800
	Z99907 04	FV-7 MORTAR WEAPON SYSTEM	(MWS)	66	282.0	117.0	113.0	70000	60200	60200
	Z99907 05	FV-7 COMBAT SMOKE VEHICLE	(CSV)	6	282.0	117.0	113.0	70000	54000	54000
	Z99907 07	FV-7 MAINTENANCE AND REPAIR SYSTEM	(MARS)	85	296.0	117.0	113.0	70000	61000	61000
	Z99907 08	FV-7 NBC RECONNAISSANCE VEHICLE		6	282.0	117.0	113.0	70000	53800	53800
	Z99907 09	FV-7 BATTALION AID		45	282.0	117.0	97.0	60000	54800	54800
	Z99907 10	FV-7 MINE DISPENSING VEHICLE	(MDV)	4	282.0	117.0	113.0	60000	55600	55600
**	Z99908 01	FV-8 RECOVERY VEHICLE		88	330.0	144.0	113.0	110000	118000	130000
	Z99909 01	FV-9 COMMAND AND CONTROL VEHICLE	(C2V)	151	282.0	117.0	113.0	60000	53800	53800
	Z99909 02	FV-9 EXTENDED TARGET AQUISITION SYSTEM	(ETAS)	10	282.0	117.0	113.0	60000	56200	56200
	Z99909 03	FV-9 INTELLIGENCE & ELECTRONIC WARFARE	(IEW)	11	282.0	117.0	113.0	60000	56200	56200
	Z99910 01	FV-10 BRIDGE		16	538.0	158.0	74.0	20000	20000	20000
	Z99910 02	FV-10 BRIDGE LAUNCHER		16	288.0	144.0	84.0	90000	90000	90000
**	Z99911 01	FV-11 COMBAT MOBILITY VEHICLE	(CMV)	20	416.0	144.0	132.0	110000	126800	130000
**	Z99911 02	FV-11 COMBAT EARTH MOVER	(CEM)	13	369.0	144.0	110.0	110000	118800	130000
**	Z99911 03	FV-11 COMBAT EXCAVATOR	(CEX)	8	416.0	144.0	132.0	110000	110000	130000

TOTALS FOR EQUIPMENT LISTED -- SQUARE FEET - 560698 MEASUREMENT TONS - 131835 SHORT TONS - 82085 86665 90190

* ALTERNATIVE 1 - ALL AFV VEHICLES EQUAL TO OR LESS THAN 55 TONS
ALTERNATIVE 2 - ALL AFV VEHICLES LESS THAN 64 TONS
ALTERNATIVE 3 - SELECTED AFV VEHICLES EQUAL TO 65 TONS

** C-17 REQUIRED WHEN THE VEHICLE WEIGHT EXCEEDS THE C-5 RAMP LIMIT OF 129,000 POUNDS.

TABLE 2

EQUIPMENT DELETIONS FROM THE ARMORED DIVISION

	LIN-INDEX	NOMENCLATURE	MODEL	COMPONENT DESCRIPTION	AUTHORIZED QUANTITY	LENGTH	WIDTH	HEIGHT	WEIGHT
	C10353 02	CARRIER CARGO: F/TRAC	M1015		11	232.0"	100.0"	100.0"	17864 LBS
*	C10703 01	CARRIER CAR TRK AMMO	M992		72	263.4"	129.8"	139.9"	42336 LBS
	C12166 02	CARRIER FERS F/TRACK	M981		45	206.0"	100.0"	103.6"	27900 LBS
*	C20414 01	BRIDGE ARM VEH LCM	CLASS 60		16	402.6"	162.0"	70.0"	29300 LBS
	C7e336 02	CAVALRY FIGHTING VEH	M3		100	268.0"	117.0"	103.8"	40037 LBS
	C7e336 04	CAVALRY FIGHTING VEH	M3	L/F ARMOR PLATE	100	110.3"	3.6"	38.3"	670 LBS
	C7e336 05	CAVALRY FIGHTING VEH	M3	R/F ARMOR PLATE	100	121.6"	3.6"	38.3"	760 LBS
	C7e336 06	CAVALRY FIGHTING VEH	M3	L/R ARMOR PLATE	100	121.3"	3.6"	48.0"	660 LBS
	C7e336 07	CAVALRY FIGHTING VEH	M3	R/R ARMOR PLATE	100	116.3"	3.6"	48.0"	680 LBS
	D10741 02	CARRIER 107MM MORT	M106A1		66	191.6"	105.4"	84.0"	20131 LBS
	D11049 06	CARRIER CARGO FTRAC	M548A1		4	222.6"	103.6"	76.3"	17060 LBS
	D11638 02	CARRIER COMD P FTRAC	M577A1		168	191.6"	100.0"	104.0"	22416 LBS
	D12087 07	CARRIER FERS FTRAC	M113A1		296	191.6"	99.6"	84.0"	19996 LBS
	D30529 02	DISPENSER MINE	M128		4	191.6"	97.2"	102.0"	12600 LBS
*	E6e678 02	CBT ENG VEH FTRAC	M728		8	289.0"	143.6"	127.6"	108080 LBS
	E6e678 03	CBT ENG VEH FTRAC	M728	MOUNDBOARD	8	146.3"	37.6"	14.3"	2480 LBS
*	E6e896 04	COMBAT VEH IMP TOW	M901A1		48	188.6"	99.3"	123.0"	22380 LBS
	J44065 06	GEN SET GED 1.6KW	MEP,025A		1	27.8"	20.3"	18.3"	121 LBS
	J46836 03	GEN SET GED 3KW	MEP 021A		2	36.0"	24.0"	26.0"	283 LBS
	J81760 02	INFANTRY FIGHTING VEH	M2		216	268.0"	117.0"	103.7"	40037 LBS
	J81760 04	INFANTRY FIGHTING VEH	M2	L/F ARMOR PLATE	216	110.3"	3.6"	38.3"	670 LBS
	J81760 05	INFANTRY FIGHTING VEH	M2	R/F ARMOR PLATE	216	121.6"	3.6"	38.3"	760 LBS
	J81760 06	INFANTRY FIGHTING VEH	M2	R/R ARMOR PLATE	216	121.3"	3.6"	48.0"	660 LBS
	J81760 07	INFANTRY FIGHTING VEH	M2	L/R ARMOR PLATE	216	116.3"	3.6"	48.0"	680 LBS
	J9e594 01	GUN ARTILLERY SP 20MM	M163		27	190.0"	100.0"	105.6"	24700 LBS
*	L67ee7 02	HOWITZER MED SP 155MM	M109A1		72	365.0"	124.6"	109.6"	46919 LBS
*	L43ee4 02	LCM BRIDGE TANK MTD	MeOCHASSIS		16	340.0"	144.0"	112.0"	90426 LBS
	L44894 01	LAUNCHER ROCKET	MLRS		9	274.6"	117.0"	103.0"	43941 LBS
	L7e566 33	LOADER SCOOP TYPE WHL	966B		4	396.6"	106.0"	91.0"	31090 LBS
	L91976 02	MACHINE GUN CAL.50	M2 HB	RECEIVER GROUP	48	36.6"	9.8"	7.8"	60 LBS
	L91976 03	MACHINE GUN CAL.50	M2 HB	BARREL	48	45.0"	2.6"	2.6"	27 LBS
	L92112 02	MACHINE GUN CAL.50	M36 FIXED	RECEIVER GROUP	8	28.0"	6.0"	6.3"	48 LBS
	L92112 03	MACHINE GUN CAL.60	M36 FIXED	BARREL	8	40.0"	2.6"	2.6"	16 LBS
	M62274 02	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	9	31.6"	19.6"	10.6"	43 LBS
	M62274 03	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	2	31.6"	19.6"	10.6"	63 LBS
	M62274 04	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	4	31.6"	19.6"	10.6"	60 LBS
	M62274 05	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	3	31.6"	19.6"	10.6"	110 LBS
	M62274 06	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	2	31.6"	19.6"	10.6"	48 LBS
	M62274 07	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	33 LBS
	M62274 08	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	89 LBS
	M62274 09	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	68 LBS
	M62274 10	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	95 LBS
	M62274 11	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	84 LBS
	M62274 12	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	69 LBS
	M62274 13	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	97 LBS
	M62274 14	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	146 LBS
	M62274 15	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	146 LBS
	M62274 16	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	83 LBS
	M62274 17	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	87 LBS
	M62 18	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	64 LBS

UNCLASSIFIED

TABLE 2

EQUIPMENT DELETIONS FROM THE ARMORED DIVISION

	LIN-INDEX	NOMENCLATURE	MODEL	COMPONENT DESCRIPTION	AUTHORIZED QUANTITY	LENGTH	WIDTH	HEIGHT	WEIGHT
	M62274 19	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	67 LBS
	M62274 20	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	72 LBS
	M62274 21	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	41 LBS
	M62274 22	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	10.6"	65 LBS
	M62274 23	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	6	31.6"	19.6"	10.6"	62 LBS
	M62274 24	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	12.6"	79 LBS
	M62274 25	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	12.6"	68 LBS
	M62274 26	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	12.6"	66 LBS
	M62274 27	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	21.6"	86 LBS
	M62274 28	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	21.6"	79 LBS
	M62274 29	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	21.6"	102 LBS
	M62274 30	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	21.6"	164 LBS
	M62274 31	MES BATTALION AID STA	NONE	MULTI ITEMS (M62274)	1	31.6"	19.6"	21.6"	171 LBS
	M68282 02	MORTAR 4.2IN ON MOUNT	M30 W/M24A1	TUBE	24	68.6"	11.6"	9.3"	160 LBS
	M68282 03	MORTAR 4.2IN ON MOUNT	M30 W/M24A1	BASE PLT	24	37.6"	37.6"	10.6"	240 LBS
	M68282 04	MORTAR 4.2IN ON MOUNT	M30 W/M24A1	STANDARD	24	24.6"	13.3"	8.3"	60 LBS
	M68282 05	MORTAR 4.2IN ON MOUNT	M30 W/M24A1	BRG ASSY	24	46.3"	24.0"	9.0"	180 LBS
	U16110 02	RADAR SET LESS POWER	AN/PPS-6A		14	62.0"	29.3"	17.3"	240 LBS
	017382 01	RADAR SET LESS POWER	AN/TPS-25		1	111.3"	77.0"	72.6"	2715 LBS
*	R60544 02	RECOVERY VEH FTRAC	M578		16	353.6"	124.0"	116.0"	49320 LBS
*	R60681 04	RECOVERY VEH FTRAC	M88A1		82	328.0"	143.8"	123.8"	107840 LBS
	R96484 01	RIFLE RECOILLESS 90MM	M67		24	68.0"	16.6"	16.6"	35 LBS
	S70594 02	STIR LON BED 40 TON	M870		2	409.3"	96.6"	69.6"	16918 LBS
	T00474 01	SWIMMER SYS TLR MTD	M51		2	167.6"	84.6"	96.8"	5360 LBS
	T10138 11	SIGNAL EQUIP TRK MTD	SECM 1976		4	218.3"	84.4"	81.8"	7290 LBS
*	T13160 10	SIGNAL EQUIP SHELTER MTD	SEQUEL-118		4	306.4"	98.8"	126.1"	33030 LBS
*	T13574 03	TANK CBT FTRAC 105MM	M1 (ABRAMS)		348	353.3"	137.0"	103.6"	116900 LBS
	T34437 03	TRAC WHL W/EXCAVATOR	CCE		8	376.0"	94.0"	96.0"	13000 LBS
	T38544 01	TRK AMB 4 LITTER 4X4	M997		6	202.1"	86.0"	99.7"	7386 LBS
	T39618 02	TRUCK CARGO 10T 8X8	M977WNN		9	400.6"	96.0"	101.0"	38800 LBS
	T681e1 02	TRUCK TANK FUEL 8X8	M978NNN		3	400.6"	96.0"	101.0"	38166 LBS
	T69278 02	TRUCK CARGO 10 T 8X8	M977 WNNN		51	400.6"	96.0"	101.0"	38300 LBS
	T81494 01	TRK UTILITY 1-1/4 TON	M998		1	180.0"	85.0"	96.6"	6468 LBS
	T83093 02	TRUCK WRECKER 8X8	M984		1	389.6"	101.0"	100.6"	43180 LBS
	T87243 02	TK TANK 2500 GAL	M978 WNNN		24	400.6"	96.0"	101.0"	38165 LBS
*	T91e66 02	TRUCK TRACTOR 6X6	M916		2	299.0"	99.0"	127.6"	27320 LBS
	V12141 53	TANK/PUMP UNIT LIQUID	LIN 096 ETP	TANK	2	72.0"	61.0"	62.0"	475 LBS
	V12141 54	TANK/PUMP UNIT LIQUID	LIN 096 ETP	PUMP	1	78.3"	32.0"	49.3"	800 LBS
	V19960 01	TANK UNIT LIQ DSPNSG	TLR MOUNTING		7	72.6"	61.0"	66.0"	410 LBS
	V98738 01	VEHICULAR PWR SUPPLY	HYP-577/SEC		1	6.0"	3.0"	2.0"	2 LBS
	W7e473 02	TRACTOR FTRAC HS ARM	M9		25	243.0"	110.0"	96.6"	86600 LBS
	W96637 01	TRAILER CARGO 3/4 TON	M101A1		1	147.0"	73.6"	60.0"	1360 LBS
	W96811 02	TRAILER CARGO 1-1/2 T	M105A2		1	166.0"	83.0"	85.0"	2670 LBS
	X40009 02	TRUCK CARGO 2-1/2 TON	M35A2		34	264.8"	96.4"	80.8"	13180 LBS
	X40077 02	TRK CGO D/S 2-1/2 TON	M35A2C		4	264.6"	97.6"	81.3"	13826 LBS
	X40116 02	TRUCK CARGO 2-1/2 TON	M35A2 WNN		1	278.6"	96.4"	80.8"	13570 LBS
	X40774 03	TRK CGO D/S 5 TON	M923		63	313.1"	97.6"	86.1"	22020 LBS
	X40831 10	TRK CGO 5 TON LWB	M924A1		1	310.6"	96.0"	93.7"	22070 LBS
*	X63297 15	TRUCK WRECKER 5 TON	M936A1 WNN		1	344.3"	96.0"	117.2"	38300 LBS

* C-6 -17 REQUIRED ITEMS.

TABLE 3

IMPACT OF THE ARMORED FAMILY OF VEHICLES ON UNIT DEPLOYABILITY

	ARMORED DIVISION: BASE CASE: 87000J430:	MODIFIED WITH AFV ALTERNATIVE: 1	CHANGE	PERCENT CHANGE	MODIFIED WITH AFV ALTERNATIVE: 2	CHANGE	PERCENT CHANGE	MODIFIED WITH AFV ALTERNATIVE: 3	CHANGE	PERCENT CHANGE
TRANSPORTABILITY MEASURES										
SQ FT (CGO VEHICLES LOADED)	1,346,856	1,491,390	+144,534	+10.7	1,491,390	+144,534	+10.7	1,491,390	+144,534	+10.7
SHORT TONS	81,773	116,521	+ 34,748	+42.5	121,100	+ 39,327	+48.1	124,626	+ 42,853	+52.4
MEASUREMENT TONS	262,263	305,374	+ 43,111	+16.4	305,374	+ 43,111	+16.4	305,374	+ 43,111	+16.4
NUMBER OF VEHICLES	7,888	7,908	+ 20	+0.3	7,908	+ 20	+0.3	7,908	+ 20	+ 0.3
C-5 / C-17 REQUIRED ITEMS	1,302	2,512	+1,210	+92.9	2,512	+1,210	+92.9	1,963	+661	+50.8
C-17 ONLY ITEMS (WEIGHTS EXCEED C-5 RAMP LIMIT)	0	0	0	0.0	0	0	0.0	549	+549	***
SORTIE REQUIREMENTS										
C-141B (57,600 LB ACL)*	1,568	610	- 958	- 61.1	604	- 964	- 61.5	763	-805	-51.3
C-5 (147,400 LB ACL)*	630	1,630	+1,000	+158.7	1,637	+1,007	+159.8	1,073	+443	+70.3
C-17 (135,000 LB ACL)*	0	0	0	0.0	0	0	0.0	549	+549	***
C-141B (87,000 LB ACL)**	1,185	740	-445	-37.5	623	-562	-47.4	684	-501	-49.0
C-5 (205,000 LB ACL)**	600	1,053	+453	+75.5	1,190	+590	+99.7	749	+149	+24.0
C-17 (172,200 LB ACL)**	0	0	0	0.0	0	0	0.0	549	+549	***
C-141B (87,000 LB ACL)**	1,231	737	-494	- 40.1	706	-525	- 42.6	746	-485	- 39.4
C-17 (172,200 LB ACL)**	622	1,360	+738	+118.6	1,380	+758	+121.9	1,400	+778	+125.1
SEALIFT REQUIREMENTS										
FAST SEALIFT SHIPS ONLY	8.6	9.6	+1	+11.6	9.6	+1	+11.6	9.6	+1	+11.6

* CHARLESTON TO TORREJON - ALLOWABLE CABIN LOADS FOR THE C-141B AND C-5 TAKEN FROM MFR 76-2 (C1), DATED 17 FEBRUARY 1982.
** GUIDE BOY TO PANSTEIN - ALLOWABLE CABIN LOADS FOR THE C-17 BASED ON ESTIMATES PROVIDED BY MCDONNELL-DOUGLAS CORPORATION.

TABLE 4

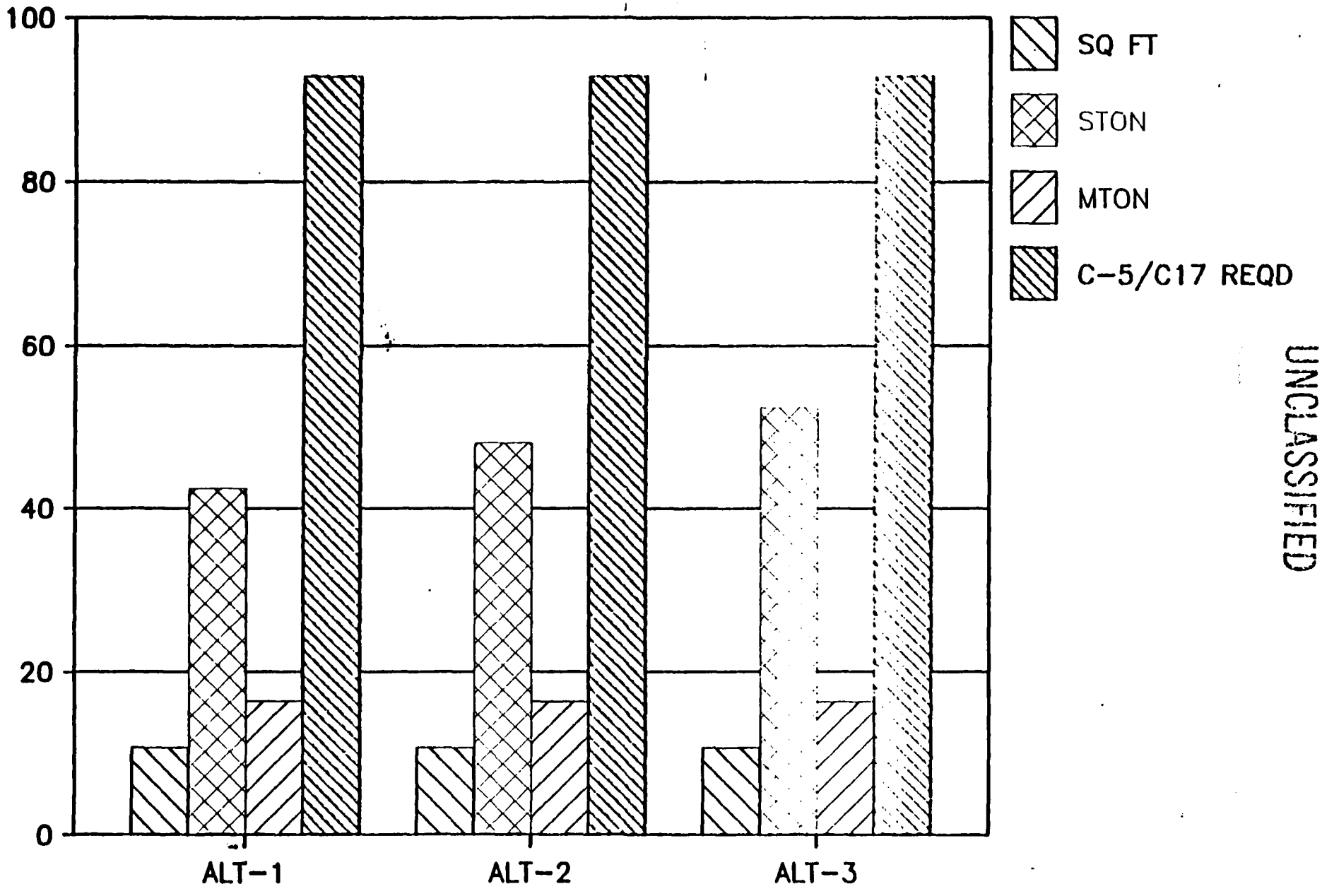
FAST SEALIFT SHIP (FSS) STOW AREA

SHIPYARD	SHIP	SQUARE FEET	
Avondale			
	USNS Altair	167,782	Roll-on Roll-off
(46 Containers)	USNS Antares	25,800	Flatracks and Seasheds
	USNS Pollux	193,582	Available Stow Area
		X .75	Stow Factor
		145,187	Usable Square Feet
NASSCO			
	USNS Algol	176,776	Roll-on Roll-off
(44 Containers)	USNS Bellatrix	25,800	Flatracks and Seasheds
	USNS Regulus	202,576	Available Stow Area
		X .75	Stow Factor
		151,932	Usable Square Feet
Pennship			
	USNS Capella	184,450	Roll-on Roll-off
(46 Containers)	USNS Denebola	25,800	Flatracks and Seasheds
		210,250	Available Stow Area
		X .75	Stow Factor
		157,688	Usable Square Feet
	Average FSS	175,322	Roll-on Roll-off
		25,800	Flatracks and Seasheds
(45.25 Containers)		201,122	Available Stow Area
		X .75	Stow Factor
		150,842	Usable Square Feet

CHART

TRANSPORTABILITY MEASURES

INCREASES FROM BASE CASE



GEN Maxwell R. Thurman
Army Vice Chief of Staff

Q. You have expressed strong support for downsizing equipment in order to enhance deployability. What do you have in mind?

A. Well, I'll give you the case of TACFIRE. TACFIRE is a revolutionary piece of equipment for the U.S. field artillery. TACFIRE was a long time in being produced. It is fielded in a five-ton truck on a 280 shelter. Commercial computers are available that would do the same job and fit in a 250 shelter, which goes on the back of a HMMWV.

The instant that the system was brought into the inventory, we should have downsized it with the immediately available computer. However, people might say more R&D would be needed because the computer wasn't adequately tested. I don't buy that. I think that's a copout. I think we must place a premium on smallness, and structure the procurement strategy so that we can pre-qualify the smaller computer.

The Army inherently believes that bigness is good and that it's perfectly all right to have a large logistical tail because we assume in the end that transportation is free and human labor is free. We must change our thinking on this because labor is not free, it's very expensive. The fixed end strength of 780,000 active military is a fact of life and we've got to learn to be a better Army within that limitation.

The Army must get things slimmed down. One way to do that is to write contracts that place a premium on smallness. NASA understands how to do this. They want miniaturized components because extra size and weight for them is very expensive. So they get it small.

We don't have that notion. Our notion is, gee whiz, let's get the Navy to drive up six more ships, get the Air Force to drive up another 10 airplanes and we'll somehow get all that stuff deployed. We can't afford it. We have to think small.

Q. Can you report on any new developments relative to the establishment of the Army's new Light Infantry Division?

A. Yes. As you know, we are now getting some very high quality equipment to make our current heavy divisions the world's best heavy divisions. This equipment includes the M1 tank, the M2 and the M3 Bradley Fighting Vehicle, the TPQ36 and 37 artillery locating radars, the Apache attack helicopter, and the Blackhawk utility helicopter. All of these items are coming off American assembly lines as a result of the the great work of the Army Materiel Command and American industry.

Having done that, I want to emphasize that we are directing our efforts at reducing excess equipment and minimizing manpower while maximizing the division's ability to perform its mission. Therefore, in the Light Infantry Division we laid the marker down to get the number of C141B sorties down below 500.

The redesign of that division calls for the principal weapon to be the world's best infantryman who can live on the ground, go to ground, and use infantry weapons and night vision devices in order to operate as well at night as during the day.

Critics may very well say that the mechanized forces have all the edge. I would respond by stating that they don't have the edge in restrictive terrain, or in urban areas.

So, we are establishing light forces that can be deployed with minimum airlift, get where they're going

". . . we have very high quality people, and very high quality people ought to have the very highest quality equipment that American industry can produce."

ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

VOLUME VI

SYSTEM MANPRINT

MANAGEMENT PLAN

31 AUGUST 1987

SYSTEM MANPRINT MANAGEMENT PLAN (SMMP)

(U) For the Armored Family of Vehicles (AFV)

(This Section Is Unclassified)

Version II September 1987

SECTION 1 - EXECUTIVE SUMMARY

1. Overview of the MANPRINT Planning.

a. The AFV MANPRINT program is a comprehensive technical effort to support AFV system effectiveness through continuous consideration and integration of Human Factors Engineering (HFE); Manpower, Personnel, and Training (MPT); Health Hazards (HH); and System Safety (SS). The major objective of AFV MANPRINT is to balance human and equipment performance, at a reasonable and affordable resource cost, resulting in optimum system effectiveness. This AFV System MANPRINT Management Plan (SMMP) describes the strategy by which this will be accomplished and details relevant data sources, program concerns, the milestone schedule, and task descriptions.

b. The AFV program is the most ambitious future force modernization program ever undertaken by the Army and marks the first time that the Army has embarked on the acquisition of a Family of Systems of this level of complexity. Current materiel acquisition procedures relate to single weapon systems and usually have one TRADOC proponent school and one AMC subordinate command as a materiel developer. AFV, with 30 subsystems, involves the orchestrated efforts of 10 TRADOC schools as proponents of actual subsystems, other schools as proponents of mission packages that will be part of one or more of these subsystems, and three integrating centers to integrate the effort. A similarly complex management structure exists within AMC.

c. The AFV program fully supports the Army MANPRINT objectives. Numerous committees and working groups, comprising various commands from across the entire spectrum of the Army, have been formed to oversee and implement the MANPRINT requirements of this program. These groups, commands, and efforts are documented in this plan. It is significant to note that the AFV will be fielded into the Active Army, United States Army Reserve (USAR), and the Army National Guard. Thus, AFV MANPRINT planning must address the Reserve Components equally with the active duty units. Roundout units in particular are likely to receive equipment early in the fielding of the Family. Since the AFV is planned to be fielded in unit sets, new equipment training for these units will be on a significantly larger scale than in the past.

2. Overview of the Program.

a. The objective of the AFV program is to develop and field a force capable of defeating the threat of the mid 1990's and beyond, while at the same time reducing overall systems and force operations and support costs. The AFV will be operated throughout the theater by combat, combat support, and combat service support units and will be the basis for the total Army's armored vehicle inventory from the mid 1990's through the next AFV. An AFV pre-Milestone I Requirements Review Council meeting was held in August 1987. A Milestone I Decision Review will be conducted in the fourth quarter of fiscal year 1989. FUE for the AFV Force is projected for 1996.

b. The AFV Acquisition Strategy involves a four-phase approach under the provisions of DOD Directive 5000.1 and DOD Instruction 5000.2, consisting of Concept Exploration/ Development, Concept Demonstration/Validation, Full Scale Development, and Full Rate Production Deployment. This SMMP outlines the scope, objectives, organizational responsibilities, and principle activities of MANPRINT relative to the AFV program.

c. The AFV MANPRINT strategy involves the application of existing and emerging technology, results of studies and analyses of lessons learned on existing military systems, ongoing defense and industry studies, and any other available information -- an organized effort to ensure that the AFV system is designed to maximize the effectiveness of the soldier, using hardware, to perform his mission. The guiding principle is that the system should be designed with full consideration of the soldier, the hardware necessary to support him, and the environment in which he will operate.

d. Numerous agencies will contribute to this effort. The lead agency is the AFV Task Force. This is a DA DCSOPS agency operating from Fort Eustis, VA. TRADOC involvement is centered around the Combined Arms Center, and Army Materiel Command involvement centers on the Tank Automotive Command.

3. Overview of the SMMP document.

a. The proponent agency for this SMMP is the Combined Arms Center (CAC). Per agreement between CAC and Soldier Support Center, National Capital Region (SSC-NCR), SSC-NCR maintains the document data base. This SMMP is a living document and will undergo constant revision. It is currently planned to update it on a quarterly basis, dated as of the last day of the quarter. The first update (version 2) will be published at the end of the first full quarter after initial approval by Commander, CAC. All comments, corrections, and updates should be directed in duplicate to Commander, Soldier Support Center - National Capital Region, ATTN: ATNC-NMF, 200 Stovall Street, Alexandria, VA 22332 (AV 221-0946) and to Commander, Combined Arms Center,

ATTN: ATZL-CAM-O, Ft. Leavenworth, KS 66027-5000 (AV 552-3294/3489).

b. The plan consists of two parts, a basic document of a general nature, and tabs, which contain specific information about the MANPRINT effort.

(1) Section 1 is the Executive Summary. Section 2 discusses the AFV System, the Acquisition Strategy, the agencies working in the program, and the guidance under which the MANPRINT effort is working. Section 3 discusses the AFV MANPRINT Strategy. Section 4 notes AFV MANPRINT Issues and Concerns.

(2) Section 5 contains Annexes, with detailed data. Annex A details the sources for available MANPRINT data. Annex B is the Milestone Schedule. Annex C describes the activities/events of Annex A. Annex D is an informational point of contact list.

SECTION 2 - DESCRIPTION

1. Description of the Proposed Materiel System.

a. The AFV will replace the entire range of currently fielded and projected armored vehicles throughout the active Army, and also within the Reserve Components (RC) and the Army National Guard (ARNG). AFV fielding will be accomplished in unit (Brigade/Division) increments to the maximum extent consistent with operational and budgeting constraints.

b. The AFV will be characterized by incorporation of modularity, component commonality (with a desired goal of total commonality of power pack, fire control, suspension items, etc.), common battlefield signature, common vehicle electronics (vetronics) architecture, and multiple system capabilities. The AFV is envisioned as a follow-on/replacement vehicle to various systems now managed or under conceptual evaluation by proponent centers. Even with the fielding of the AFV family, a high/low (new/old) mix of equipment and technology is expected well beyond the year 2000. In order to optimize commonality throughout the fleet, the AFV should be developed with consideration given to the following technological areas:

(1) Advanced survivability technologies to reduce the size/weight of individual systems through the use of innovative materials and electronic devices.

(2) Modular vetronics, propulsion, fire control, position navigation, maintenance and C^3 components.

(3) Tunable armor and suspension systems, capable of being tailored to other mission requirements.

(4) Advanced NBC survivability systems.

(5) State-of-the-art diagnostic and prognostic testing devices which incorporate an automated call capability for supply/resupply to the appropriate maintenance and supply organizations and also support common training programs.

(6) Robotics and artificial intelligence.

(7) Human factors engineering and soldier-machine interface advances.

(8) Embedded training as a primary training option for operators and crews. Embedded training is defined as that training which results from features designed and built into a specific end item of equipment which provides training in its use. This concept can be especially useful in the reserve component units.

2. Acquisition Strategy.

a. AFVTF goals projected having hardware on the ground by FY95. This resulted in the decision to develop the AFV under an aggressive acquisition schedule.

b. Concept Exploration/Definition Phase (FY88-89). Activities during this phase are influenced by the facts that the system to be acquired is the family of vehicle and funds currently budgeted for this phase are extremely constrained. CED phase has therefore been structured to yield maximum data regarding the performance of the technologies and components which make up the family, the ability to control interfaces, and the risks anticipated to achieve the required integration.

(1) Objectives of this phase of the program are to demonstrate that technology critical to the program is sufficiently mature to enter Full Scale Development; to demonstrate through mock-ups and simulations that interface/ integration of the AFV, to include the critical technologies, is attainable; to verify/validate that required performance levels are achievable (using simulation techniques); and to produce a system specification which includes aggressive RAM growth guidelines.

(a) To accomplish the above, maximum use of simulators and simulation is required during CED. Automatic Test Equipment (ATE) requirements will be determined using system modeling analysis to identify ATE requirements at each level of maintenance. Three AFV FY87 study contracts will be amended to include design, fabrication, and characterization of the predicted performance of up to 2 chassis and up to 4 mission

modules in FY88-89. Full scale, engineering level detail mock-ups will be constructed to support this effort. Additionally, each contractor will design and fabricate a reconfigurable, interactive crew display demonstrator capable of being used with a dynamic simulator (i.e., TMBS). Finally, detailed planning for MANPRINT, Logistics Support Analysis (LSA)/LSA Record (LSAR), producibility, and testability will be initiated. The mock-ups, interactive demonstrator, and performance characterization data will be completed in FY89 and subjected to physical (static/dynamic) and analytical simulations to verify/validate the contractor's predicted performance.

(b) In addition to the AFV system level activities described, the program is structured to leverage ongoing Army advanced and full scale development demonstrations of critical pacing components. These demonstrations will be conducted throughout CED. The data thus obtained will be used to augment and reinforce the results achieved in simulation. The AFV program will similarly leverage the ongoing Defense Advanced Research Projects Agency (DARPA) Armor/Anti Armor Program.

(2) Objectives, when achieved, will provide the basis for the Milestone I(II) Decision in 4th Qtr FY89 to enter the FSD Phase.

c. Full Scale Development Phase (FY90-93).

(1) FSD will be a competitive development phase during which full scale prototype vehicles will be designed, fabricated, and tested. Approximately 100 prototype vehicles will be tested. To the extent practicable, these prototypes will be produced along the same lines as envisioned for the Full Rate Production Phase; with chassis and mission modules produced at multiple sites and integrated by selected contractors.

(2) The RFP for this phase of the program will identify promising candidates for Pre-Planned Product Improvements (P3I). Prospective offerors will be required to show how these candidates would/could be efficiently and economically incorporated into their proposed designs. They will be further advised that this will be part of the source selection criteria for this phase of the program. Contractors will not be limited in this regard to candidates identified by the Government.

d. The guidance to have hardware on the ground by FY95 dictates a production decision in 4th Qtr FY93 with contract award in 1st Qtr FY94. In order to assure the availability of Long Lead Time Items to support the required fielding date it is planned to contract for these items in FY93 prior to the completion of all required user testing. This approach is not considered to be an undue risk in that Technical Testing and the Physical Maintenance Tear-Down will have been completed prior to these awards.

3. Agencies.

a. Lead Agency for AFV MANPRINT is the AFV Task Force (AFVTF), an operating agency of the Department of the Army Deputy Chief of Staff for Military Operations (DCSOPS) - overall management responsibility for the project.

b. Other Agencies Participating in MANPRINT Effort:

(1) TRADOC:

(a) CAC - Combat Integration, Overall System Proponency

(b) LOGCEN - Logistics Integration

(c) SSC-NCR - Personnel Integration, MANPRINT

(d) CENTERS - Subsystem Proponency

(e) TRADOC Analysis Command (TRAC) - Combat Effectiveness Analysis, Support Effectiveness Analysis

(2) AMC:

(a) Tank Automotive Command (TACOM)

(b) Human Engineering Laboratory (HEL)

(c) US Army Laboratory Command (LABCOM)

(d) Other MSC/Labs

(3) OTHERS:

(a) Army Research Institute (ARI)

(b) National Guard Bureau (NGB)

(c) Office, Chief of Army Reserve (OCAR)

(d) Office of the Surgeon General (OSG)

(e) Comptroller of the Army (Cost and Economic Analysis Center)

(f) Health Services Command (HSC)

(g) US Army Safety Center (USASC)

(h) DOD Training and Performance Data Center (TPDC)

4. Guidance.

a. The AFV Task Force Charter, signed by the VCSA on 4 October 1985, directs:

(1) The AFV approach must significantly reduce system and force operations and support costs. Reduction in costs will be achieved through modularity, components commonality, and multiple systems capabilities. The AFV approach must achieve the required effectiveness with more survivable, cost effective systems.

(2) Support structure savings must be considered in both Active and Reserve Components and the training/support base. Both peacetime and wartime structure and system savings must be studied.

(3) Other AFV requirements include simplified training, crew reduction, the capability to conduct sustained operations, and improved resupply/repair capability. Soldier savings must be identified in terms of numbers of people as well as dollars.

b. The OSD-approved AFV Justification for Major Systems New Start (JMSNS) states:

(1) The AFV fleet is to significantly reduce overall cost of procurement, operations, and sustainment. Where possible and feasible, man will be replaced with robotics or suitable technology to quicken time lines of battle and reduce personnel associated costs.

(2) The AFV will be designed to replace all armored vehicles now or projected to be in the Total Army inventory and will focus on reducing O&S costs while improving force effectiveness.

(3) No increase in manpower resource requirements will result from the AFV program.

(4) MANPRINT issues shall be incorporated into the design and development of this system. Logistics, personnel, training, and related considerations should look to reduce authorizations and costs and, in no case, provide for increase.

SECTION 3. - MANPRINT STRATEGY

1. Objectives.

a. Manpower

(1) Live within (or under) the current Army manpower ceiling (AFV Manpower Footprint).

(2) Whenever it makes sense, reduce the soldier requirement through initiatives such as crew reduction, MOS restructure, fewer maintenance personnel, and robotics.

b. Personnel

(1) Reduce or optimize soldier-related O&S costs for the force over the life-cycle.

(2) Eliminate or simplify through design or technology all high driver tasks identified by analyses or test and evaluation.

(3) Through commonality, establish a fixed soldier task base for the family. Allow minimum possible minor variation for mission subsystems.

(4) Through system design, enable crew performance of all critical tasks with 99% reliability by not less than 95% of soldiers (target audience).

(5) Ensure equitable distribution of crew workload (both cognitive and physical) during peakload periods.

(6) Ensure that maintenance tasks are designed to allow performance by one soldier, and to accommodate both male and female personnel.

(7) Integrate combat development and technology base information systems with personnel long range planning.

(8) Ensure sustained high levels of soldier performance within both system and total force contexts. Prescribe maximum physical or cognitive workload levels.

(9) Establish consistent modes of operation across the family, and ensure the ability of units to continue to operate effectively for extended periods, and after losses from battle damage, hardware failure, and/or personnel injury or illness.

(10) Achieve - where possible, practical, and warranted - a reduction in the number of MOS's in the Army.

c. Training

(1) Optimize the use of existing and emerging training concepts and technologies to reduce to the maximum extent possible the training burden for both schools and units, and to enhance realism.

(2) Train critical tasks at schools/institutions, and allow no increase in unit training tasks.

(3) Maximize the use of embedded training technologies.

(4) Address the challenge of horizontal integration of training effort for AFV.

(5) Develop a unified, integrated training program for the AFV, considering the total (Active, Reserve, and National Guard) Army.

(6) Ensure that there is a corresponding reduction in training ammunition requirements commensurate with increased system performance.

(7) Define the training methodology, concepts, and strategy in an Individual and Collective Training Plan (ICTP).

(8) Assess costs of AFV training alternatives.

(9) Develop fielding training courses of action (COA).

(10) Minimize the complexity (for operators and maintainers) created in integrating subsystems into the AFV.

d. Human Factors Engineering

(1) Maximize Soldier Machine Interface (SMI) design commonality among and between subsystems, simulators, and training devices.

(2) Avoid repeating the MANPRINT soldier-machine interface (SMI) shortcomings of the existing armored fleet.

(3) Standardize crew compartment layouts among subsystems whenever possible.

(4) Structure the paths of weapon degradation so that soldiers can continue to fight with degraded weapons.

(5) Ensure that all maintenance tasks can be performed by the 5th percentile female through the 95th percentile male soldiers and provide early identification of those tasks that cannot be made to meet this objective.

(6) Ensure that human performance is given equal importance with hardware performance in system design.

e. System Safety

(1) Ensure crew safety and minimize crew vulnerability through encapsulation.

(2) Eliminate safety risks which degrade performance, including those identified in analyses of predecessor systems.

(3) Ensure crew and critical component survivability against laser, millimeter wave and other directed energy weapon technologies.

(4) To the maximum possible and feasible, ensure all explosives and volatile substances (ammunition, fuel etc.) are compartmented separately from the crew.

(5) Ensure safety considerations can be met without an increased demand on Manpower/Personnel/Training (MPT) resources.

f. Health Hazard: Eliminate health hazard risks which degrade performance, including those hazards identified by analyses of predecessor systems.

g. Other

(1) Fully integrate MANPRINT into the design of the system, including its support structure.

(2) Identify early in the developmental cycle those MANPRINT analyses, tests, and evaluations whose results are critical to anticipated system performance to provide input as "design drivers."

(3) Influence system design for optimum total system performance (Ps), as a function of Human Performance (Ph), Equipment Performance (Pe) and Environment (N), by considering manpower, personnel, training, human factors engineering, system safety and health hazards before making a functional allocation of tasks among people, equipment, and software.

(4) Ensure that the AFV force and concepts for its employment conform to the capabilities and limitations of the soldier in an operational environment consistent with tactical requirements and logistic capabilities.

(5) Control AFV total life cycle soldier/materiel systems costs by assuring consideration of the costs of personnel resources, training, and support for alternative systems during the Requirements/Technology Base Activities Phase, and for the selected AFV designs during subsequent phases.

(6) Assure that proposed hardware/software technologies are as mature as possible with respect to MANPRINT issues (e.g., skill requirements known and acceptable) before they are introduced into the AFV configuration as a subsystem.

(7) Prioritize existing technology actions (and where necessary, initiate new actions) which directly support MANPRINT.

(8) Explore commonality to minimize soldier requirements and improve soldier efficiency.

h. Explore design concepts which support soldiers under continuous extended operations by providing reduced vulnerability and increased safety for extended periods against direct, indirect, NBC, and directed energy weapons, as well as a psychologically acceptable work environment.

i. Explore design concepts which allow soldiers to continue to fight with their systems under degraded conditions, such as battle damage, equipment malfunction, personnel illness, fatigue etc.

j. Explore concepts for the soldier development and management systems (recruiting, career field structuring, training) to support force efficiency and effectiveness initiatives generated by the AFV.

k. Ensure soldier performance and cost issues are addressed in the AFV analysis efforts at both the subsystem and unit/force levels (adjust when possible, create when necessary).

l. Ensure soldier issues are highlighted in the Combat Effectiveness Analysis, Supportability Analysis, and Cost and Operational Effective Analysis, and that all soldier issues are clearly identified as MANPRINT issues in key decision briefings and program documents.

m. Provide MANPRINT guidance and direction to subordinate subsystem MANPRINT Joint working Groups efforts.

n. Identify key soldier concerns associated with the most promising design concepts which must be addressed and adequately resolved for AFV to succeed.

p. For critical MANPRINT concerns and issues, establish redundancies within MANPRINT analyses to allow comparisons of results to assist in determining courses of action.

q. Maintain continuous MANPRINT information usage in program level trade-offs and decisions through quarterly integration and review meetings.

r. Ensure adequate identification, and follow-on resolution of all key soldier concerns prior to Milestone I to ensure a capable and efficient AFV system.

s. Within the program, identify and fence MANPRINT funds to the extent possible.

t. Establish rigorous, well defined statements of requirements prior to Milestone I to support disciplined system testing.

2. Data Sources/Availability.

a. The AFV MANPRINT effort will utilize all relevant results from studies (previous, ongoing, and planned); experience; similar systems; Concept Evaluation Programs (CEP) and Force Development Testing and Experimentation (FDTE); and existing Logistic Support Analysis (LSA), Human Factors Engineering Analyses (HFEA), Early Comparability Analyses (ECA) HARDMAN Analyses, etc. The detailed list of data sources is at TAB A.

b. Early availability of Data/Risk Analysis. The primary risk of failure to provide full front end MANPRINT analysis effort to the program is that this data will not reflect in requirements documents, and thus not be translated into the contractual documentation, either within Statements of Work or Requests for Proposal. MANPRINT effectiveness decreases as time passes in the Life Cycle of the system, and becomes minimal when significant design effort has been completed, as the cost to amend design is generally prohibitive. MANPRINT must take place early in the AFV acquisition program.

c. Planned Level of MANPRINT Analysis Effort

(1) Current efforts are aimed at structuring a program which ensures the AFV conforms to the capabilities and limitations of the fully equipped 21st Century soldier and can be operated and maintained in the projected operational combat environment consistent with tactical requirements and logistic capabilities. Insights to AFV MPT impacts are being developed through a coordinated effort by the TRADOC integrating centers to examine the soldier (MOS and grade) requirements to operate, maintain, and support the AFV force. In addition, the following tasks have been initiated:

(a) Early comparability analyses (ECA) to identify the MPT "high driver" tasks associated with current systems which can be eliminated or limited in the design of the new system.

(b) Hardware versus Manpower (HARDMAN) analyses on selected AFV subsystems which appear to have the most significant MPT risks.

(c) Application of Man Integrated Systems Technology (MIST) which will give an indication of the MPT impacts of system commonality.

(d) An AFV Target Audience Description (TAD), developed by proponent schools and the DOD Training and Performance Data Center, providing engineers with a profile of AFV soldier characteristics.

(e) An examination of commonality of crew compartments and stations (to include interfaces, controls, and displays) by the AFV contractor teams to provide estimates of the associated savings and impacts in terms of MPT. Their concept designs will also involve the quantification of soldier performance as a factor of predicted AFV System performance.

(2) Concept Exploration/Definition Phase MANPRINT efforts will focus on the quantification of total system performance (which will include human performance as an integral element) to ensure an optimal relationship between AFV force structure and doctrine, technology, system design, and soldiers. To achieve this goal, CED Phase efforts will include:

(a) A total system HARDMAN/MIST analysis based on the emerging family described in the Concept Formulation Package.

(b) An AFV soldier affordability/supportability examination using the Manpower Long Range Planning System (MLRPS), LSA and Basis of Issue Plan (BOIP)/Quantitative and Qualitative Personnel Requirement Information (QQPRI) processes.

(c) Development of embedded training concepts and requirements through a joint effort of the Army Research Institute (ARI), Army Training Support Center (ATSC), Combined Arms Training Activity (CATA) and PM TRADE.

(d) Soldier-in-the-loop simulations to complement and reinforce the design effort. Promising technologies and design approaches (including Position/Navigation (POSNAV), Battlefield Management System (BMS), fire control/sensor suite options, C^2, vehicle size/signature variations, and crew size variations) will be iteratively examined using Simulation Network-Developmental (SIMNET-D). Reconfigurable interactive crew display demonstrators will be built by each contractor team to develop optimum crew compartment designs. The results of these design efforts will be integrated into full scale engineering mock-ups and validated with dynamic simulation. Additionally, parallel design concept testing and verification will be conducted through advanced development demonstrations.

(e) Applied studies in human engineering, psychophysiology, and soldier-materiel system analysis to assure that AFV designs and operational concepts are compatible with the capabilities and limitations of operators and maintenance personnel, and that systems engineering is consistent with applicable safety and health standards.

(f) Early definition of anthropometric data through the TAD process to provide engineers with design parameters required for ergonomically acceptable AFV design. Maximum soldier-machine interface (SMI) design commonality will be sought among compartment design/layouts, weapon stations/ fire control, maintenance and support etc.

(g) Operational requirements specified in the ROC to prescribe parameters for continuous operations and life support systems to be considered during Concept Exploration/ Definition, and validated on early mock-ups/prototypes, technology demonstrations, and surrogates.

(h) Soldier vulnerability reduction through encapsulation, armor technologies, compartmentalization, and design aids will be examined through coordinated efforts among the Human Engineering Laboratory (HEL)., Office of the Surgeon General (OSG), the Army Safety Center, Health Services Command (HSC), Medical Research and Development Command (MRDC), and LABCOM.

(i) The completion of an AFV Human Factors Engineering Analysis (HFEA), System Safety Assessment Report (SAR), and Health Hazards Assessment (HHA).

SECTION 4 - MANPRINT CONCERNS

1. Concerns that must be resolved for successful completion of this program are:

a. Manpower. Can a viable organizational structure be developed that will be combat effective, meet the manpower constraint goals of the program, and support a family of vehicles concept for the Total Army?

b. Personnel. Who is the soldier of the 1990's?

c. Training. Can a family of vehicles be developed and fielded within the Total Army without significant additional burden to both the institutional and sustaining training base?

d. Human Factors. Can a family of vehicles be designed that maximizes the potential of the individual soldier under the battlefield environment of the mid-1990's, at an acceptable cost?

e. System Safety. What technologies, new doctrine, or other changes are required to provide acceptable survivability on the battlefield?

f. Health Hazard. What hazards will exist on the battlefield, both from threat sources and the family of vehicles itself, and how can their effects be minimized?

g. Other. Can an overall Operations and Support (O&S) cost reduction be achieved?

SECTION 5 - ANNEXES

A. DATA SOURCES

B. MANPRINT MILESTONE SCHEDULE

C. TASK DESCRIPTIONS

D. COORDINATION

(U) ANNEX A - Data Sources
(This Annex Is Unclassified)

This ANNEX lists the sources for information and data to support the MANPRINT related activities of the AFV Program.

Information Source	Involved Domain	Data Elements Gathered From: Predecessor	New System	New Technology
Mission Area Analysis	M P T HF HH SS	X	X	
SMMP(s)	M P T HF HH SS	X	X	
O&O Plans	M P T HF HH SS	X	X	
ROC(s)	M P T HF HH SS	X	X	
BOIP(s)	M P	X	X	
QQPRI(s)	M P	X	X	
ICTP(s)	T	X	X	
HFEA(s)	HF	X	X	
HHAR(s)	HH	X	X	
SSAR(s)	SS	X	X	
TEMP(s)	M P T HF HH SS	X	X	
TR(s)	M P T HF HH SS	X	X	
PTEA(s)	T	X	X	
CTEA(s)	T	X	X	
COEA(s)	M P T	X	X	
IEP/IER(s)	M P T HF HH SS	X	X	
AR 611-201	M P	X	X	
	P	X	X	
	M P T HF HH SS	X	X	
HARDMAN Analysis	M P T	X	X	X
ECA(s)	M P T	X	X	
LSA	M P T HF HH SS	X	X	
CEP(s)	M P T HF HH SS	X	X	
Ind Contract Studies	M P T HF HH SS	X	X	X
Seat/Sight Ctrl/Interface Study	HF	X	X	X
Soldier Unit Perf Research	T HF	X	X	
Exercise Management Systems	T HF	X	X	
Arty Control Environment	T HF	X	X	
Global Positioning System	T HF	X	X	

VI-A-1

Information Source	Involved Domain	Data Elements Gathered From: Predecessor	New System	New Technology
Advanced Graphics with GPS Digital Systems	T HF	X	X	
Continuous Operations	T HF	X	X	

Schedule Name: Main AFV SMMP Time line Chart
Project Manager: De Vault
As of date: 20-Oct-87 3:29pm Schedule File: C:\TLDATA\AFVMAIN

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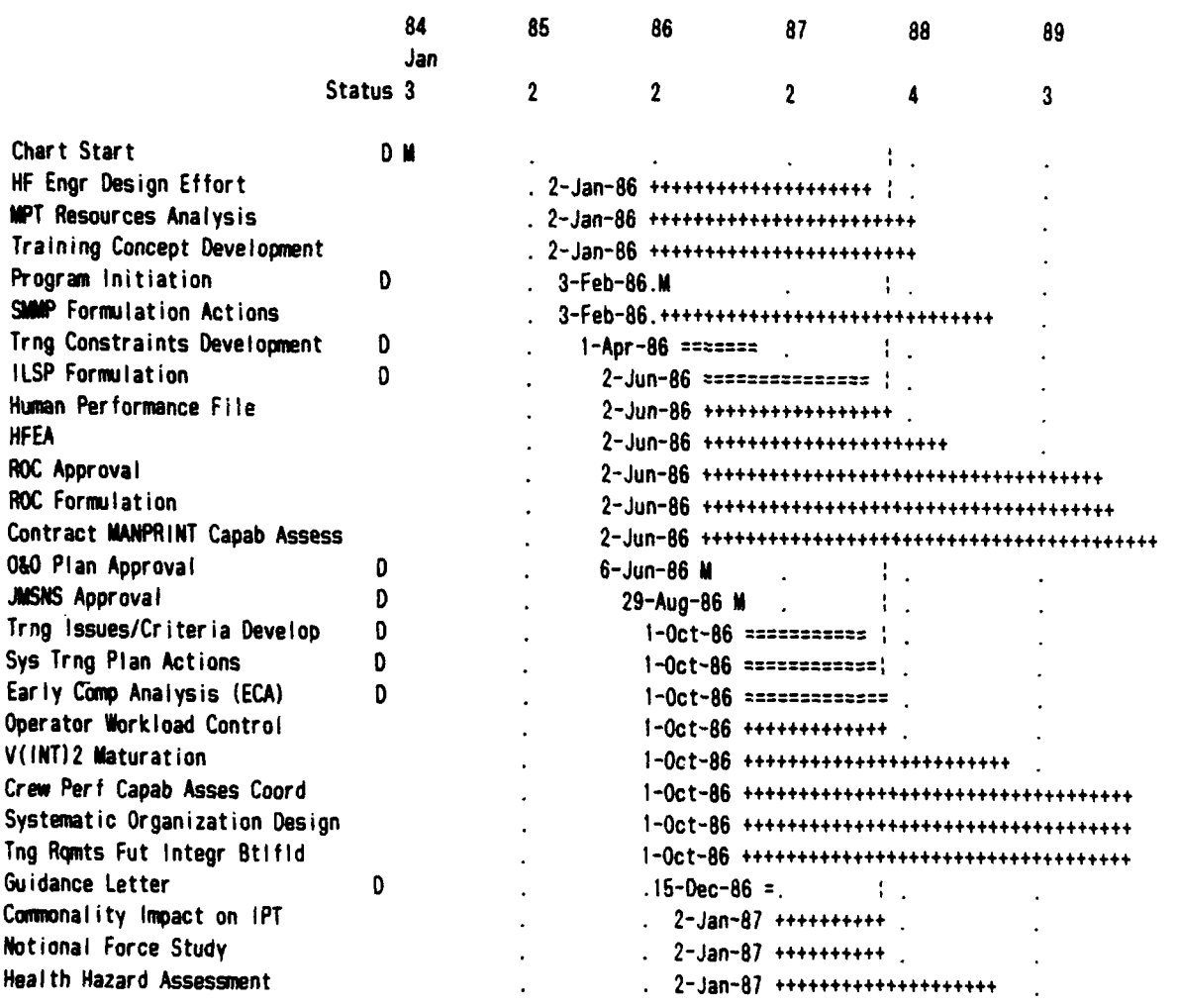
(U) ANNEX B (This Annex Is Unclassified)



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R Resource conflict M Milestone > Conflict
p Partial dependency
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 1, Page 1

Schedule Name: Main AFV SMMP Time line Chart
Project Manager: De Vault
As of date: 20-Oct-87 3:29pm Schedule File: C:\TLDATA\AFVMAIN

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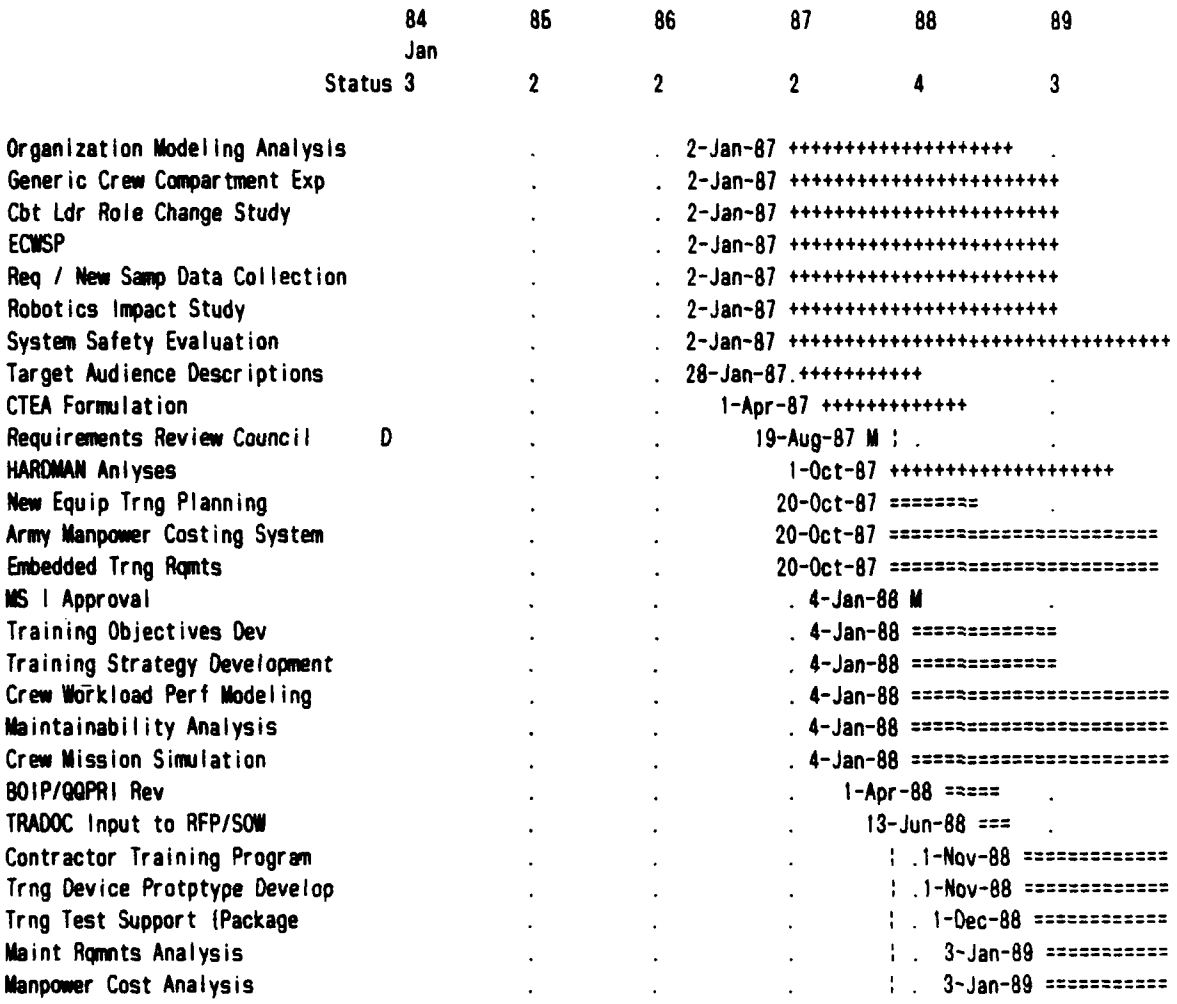
ANNEX B



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ANNEX B

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MS II Prove Out Decision			.	.	.	.	31-May-89 M
CAD/ITP			.	.	.	.	.
IKTP			.	.	.	.	.
MOS Impact Estimation			.	.	.	.	.
STRAP/NETP Updaste			.	.	.	.	.
Test Player Training			.	.	.	.	.
POI Development			.	.	.	.	.
Resident Training Program Dev			.	.	.	.	.
Training Device Development			.	.	.	.	.
Unit Training Spt Pkg Develop			.	.	.	.	.
MS III Production Decision c			.	.	.	.	.
Resident Training	C		.	.	.	.	.
Post Fielding Eval	C		.	.	.	.	.
Project Termination			.	.	.	.	.

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C Critical +++ Started task Resource delay (---==)
R Resource conflict M Milestone > Conflict
p Partial dependency
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 1, Page 3

Schedule Name: Main AFV SMMP Time line Chart
Project Manager: De Vault
As of date: 20-Oct-87 3:31pm Schedule File: C:\TLDATA\AFVMAIN

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Chart Start	D		.	.	.	.	.
HF Engr Design Effort			.	.	.	.	.
MPT Resources Analysis			.	.	.	.	.
Training Concept Development			.	.	.	.	.
Program Initiation	D		.	.	.	.	.
SMMP Formulation Actions			.	.	.	.	.
Trng Constraints Development	D		.	.	.	.	.
ILSP Formulation	D		.	.	.	.	.
Human Performance File			.	.	.	.	.
HFEA			.	.	.	.	.
ROC Approval			.	.	.	.	.
ROC Formulation			.	.	.	.	.
Contract MANPRINT Capab Assess	+		.	.	.	.	.
O&O Plan Approval	D		.	.	.	.	.
JMSNS Approval	D		.	.	.	.	.
Trng Issues/Criteria Develop	D		.	.	.	.	.
Sys Trng Plan Actions	D		.	.	.	.	.
Early Comp Analysis (ECA)	D		.	.	.	.	.
Operator Workload Control			.	.	.	.	.
V(INT)2 Maturation			.	.	.	.	.
Crew Perf Capab Asses Coord			.	.	.	.	.
Systematic Organization Design			.	.	.	.	.
Trng Rqmts Fut Integr Btlfld			.	.	.	.	.
Guidance Letter	D		.	.	.	.	.
Commonality Impact on IPT			.	.	.	.	.
Notional Force Study			.	.	.	.	.
Health Hazard Assessment			.	.	.	.	.

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Scale: Each character equals 1 month

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Schedule Name: Main AFV SMMP Time line Chart
Project Manager: De Vault
As of date: 20-Oct-87 3:33pm Schedule File: C:\TLDATA\AFVMAIN

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ANNEX B

	90 Jan	91	92	93	94	95
Status	2	2	2	4	4	3
Organization Modeling Analysis		.	.	.	.	.
Generic Crew Compartment Exp		.	.	.	.	.
Cbt Ldr Role Change Study		.	.	.	.	.
ECWSP		.	.	.	.	.
Req / New Samp Data Collection		.	.	.	.	.
Robotics Impact Study		.	.	.	.	.
System Safety Evaluation	+	.	.	.	.	.
Target Audience Descriptions		.	.	.	.	.
CTEA Formulation		.	.	.	.	.
Requirements Review Council	D	.	.	.	.	.
HARDMAN Anlyses		.	.	.	.	.
New Equip Trng Planning		.	.	.	.	.
Army Manpower Costing System		.	.	.	.	.
Embedded Trng Rqmts		.	.	.	.	.
MS I Approval		.	.	.	.	.
Training Objectives Dev		.	.	.	.	.
Training Strategy Development		.	.	.	.	.
Crew Workload Perf Modeling	=	.	.	.	.	.
Maintainability Analysis	=	.	.	.	.	.
Crew Mission Simulation	==========	.	.	.	.	.
BOIP/QQPRI Rev		.	.	.	.	.
TRADOC Input to RFP/SOW		.	.	.	.	.
Contractor Training Program	==========.	.	.	.	.	.
Trng Device Protptype Develop	==========.	.	.	.	.	.
Trng Test Support (Package	==========	.	.	.	.	.
Maint Rqmnts Analysis	==========	.	.	.	.	.
Manpower Cost Analysis	==========	.	.	.	.	.

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Scale: Each character equals 1 month

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Schedule Name: Main AFV SMMP Time line Chart
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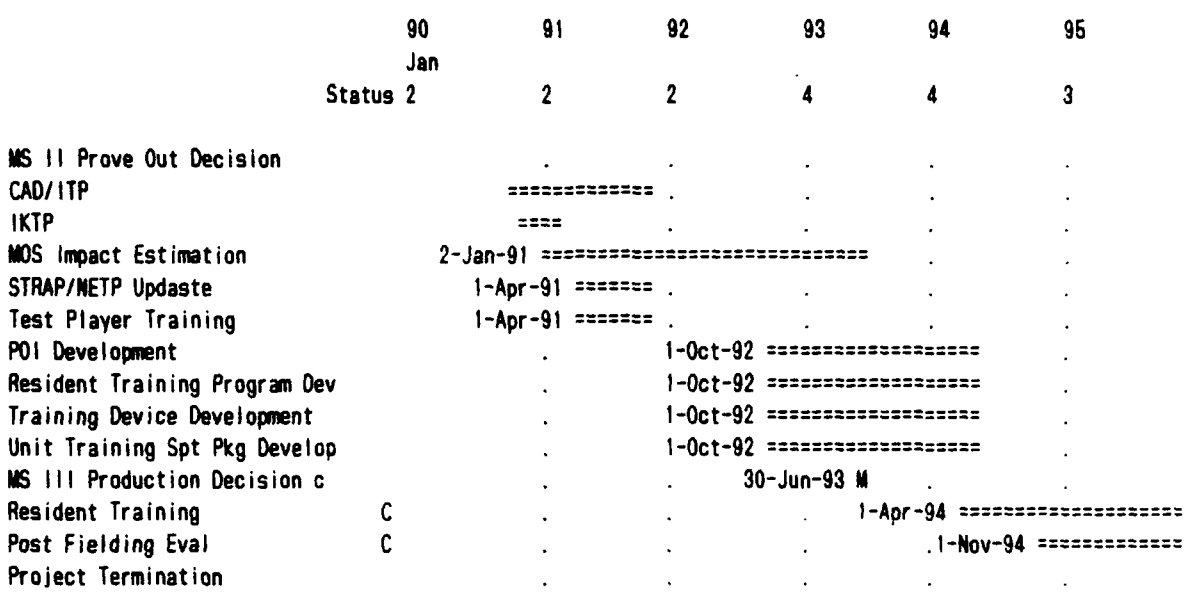

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Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 2, Page 3

Schedule Name: Main AFV SMMP Time line Chart
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AFV SMMP Version 2/Oct 87
ANNEX B

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MPT Resources Analysis			.	.	.	.	.
Training Concept Development			.	.	.	.	.
Program Initiation		D	.	.	.	.	.
SMMP Formulation Actions			.	.	.	.	.
Trng Constraints Development		D	.	.	.	.	.
ILSP Formulation		D	.	.	.	.	.
Human Performance File			.	.	.	.	.
HFEA			.	.	.	.	.
ROC Approval			.	.	.	.	.
ROC Formulation			.	.	.	.	.
Contract MANPRINT Capab Assess			.	.	.	.	.
O&O Plan Approval		D	.	.	.	.	.
JMSNS Approval		D	.	.	.	.	.
Trng Issues/Criteria Develop		D	.	.	.	.	.
Sys Trng Plan Actions		D	.	.	.	.	.
Early Comp Analysis (ECA)		D	.	.	.	.	.
Operator Workload Control			.	.	.	.	.
V(INT)2 Maturation			.	.	.	.	.
Crew Perf Capab Asses Coord			.	.	.	.	.
Systematic Organization Design			.	.	.	.	.
Tng Rqmts Fut Integr Btlfld			.	.	.	.	.
Guidance Letter		D	.	.	.	.	.
Commonality Impact on IPT			.	.	.	.	.
Notional Force Study			.	.	.	.	.
Health Hazard Assessment			.	.	.	.	.

D Done === Task - Slack time (==---), or
C Critical +++ Started task Resource delay (---==)
R Resource conflict M Milestone > Conflict
p Partial dependency
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 3, Page 1

Schedule Name: Main AFV SMMP Time line Chart
Project Manager: De Vault
As of date: 20-Oct-87 3:37pm Schedule File: C:\TLDATA\AFVMAIN

AFV SMMP Version 2/Oct 87
ANNEX B

	96 Jan	97	98	99	00	01
Status	2	2	2	4	4	2
Organization Modeling Analysis		.	.	.	.	.
Generic Crew Compartment Exp		.	.	.	.	.
Cbt Ldr Role Change Study		.	.	.	.	.
ECWSP		.	.	.	.	.
Req / New Samp Data Collection		.	.	.	.	.
Robotics Impact Study		.	.	.	.	.
System Safety Evaluation		.	.	.	.	.
Target Audience Descriptions		.	.	.	.	.
CTEA Formulation		.	.	.	.	.
Requirements Review Council	D	.	.	.	.	.
HARDMAN Anlyses		.	.	.	.	.
New Equip Trng Planning		.	.	.	.	.
Army Manpower Costing System		.	.	.	.	.
Embedded Trng Rqmts		.	.	.	.	.
MS I Approval		.	.	.	.	.
Training Objectives Dev		.	.	.	.	.
Training Strategy Development		.	.	.	.	.
Crew Workload Perf Modeling		.	.	.	.	.
Maintainability Analysis		.	.	.	.	.
Crew Mission Simulation		.	.	.	.	.
BOIP/QQPRI Rev		.	.	.	.	.
TRADOC Input to RFP/SOW		.	.	.	.	.
Contractor Training Program		.	.	.	.	.
Trng Device Protptype Develop		.	.	.	.	.
Trng Test Support (Package		.	.	.	.	.
Maint Rqmnts Analysis		.	.	.	.	.
Manpower Cost Analysis		.	.	.	.	.

D Done === Task - Slack time (==---), or
C Critical +++ Started task Resource delay (---==)
R Resource conflict M Milestone > Conflict
p Partial dependency
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 3, Page 2

Schedule Name: *Main AFV SMMP Time line Chart*
Project Manager: De Vault
As of date: 20-Oct-87 3:38pm Schedule File: C:\TLDATA\AFVMAIN

AFV SMMP Version 2/Oct 87
ANNEX B

		96 Jan	97	98	99	00	01
	Status	2	2	2	4	4	2
MS II Prove Out Decision			.	.	.	.	.
CAD/ITP			.	.	.	.	.
IKTP			.	.	.	.	.
MOS Impact Estimation			.	.	.	.	.
STRAP/NETP Updaste			.	.	.	.	.
Test Player Training			.	.	.	.	.
POI Development			.	.	.	.	.
Resident Training Program Dev			.	.	.	.	.
Training Device Development			.	.	.	.	.
Unit Training Spt Pkg Develop			.	.	.	.	.
MS III Production Decision c			.	.	.	.	.
Resident Training	C	==========	==========	==========	==========		.
Post Fielding Eval	C	==========	==========	==========	==========		.
Project Termination			.	.	. 30-Dec-99 M		.

D Done === Task - Slack time (==---), or
C Critical +++ Started task Resource delay (---==)
R Resource conflict M Milestone > Conflict
p Partial dependency
Scale: Each character equals 1 month

TIME LINE Gantt Chart Report Strip 3, Page 3

ANNEX C
(U) MANPRINT ACTIVITY DESCRIPTION
(This Annex Is Unclassified)

This Annex describes the required MANPRINT actions for the AFV program. These actions also reflect in the Milestone schedule of Annex B. The activities generate from the MANPRINT questions of Annex D.

1. Task Description. AFV Generic Crew Compartment Concept Exploration.

Rationale An integrated effort by design engineers and human factors engineers to explore the benefits and liabilities of developing a standardized crew compartment which is specifically designed to support the soldier, both as an individual with metabolic demands, physical characteristics and capability limitations and as part of an organization operating as a coordinated crew and unit. The development of an efficient closed, physiologically supportable environment is critical for sustained operations on a dirty battlefield (NBC contamination). "Fly by wire" transducer mechanisms which now exist make it unnecessary for crewmen to be in close proximity to the actual equipment operated. In addition, the development of a space devoted to the crew and its mission operation will reduce the engineering tendency to add product improvements inside the crew space (compartment), and thereby "PIP-away" soldier space, making the crew space unlivable, inefficient, and even dangerous. This project requires engineers to design a functional environment optimized for the soldier, just as they would carefully design an environment to support electronic components which can be easily damaged or degraded. Timing: Should be initiated immediately through careful application and adjustment of the ongoing Tank Test Bed, surrogate Research Vehicle and SIMNET-D Programs. The generic concept of crew compartmentalization can be explored without knowing AFV design details.

Resources $500 K(+)

Time to Complete (Execution timeframe: 1987 - 1988)

Responsible Agency CAC

Support Agency ARI/HEL/TACOM/AFVTF

Task Flow Dependencies - none
Feeds - HFEA

Generating MANPRINT Question:

Status

2. Task Description Engineers Contact with Soldiers Project (ECWSP)

Rationale ECWSP brings engineers into contact with soldiers in a field environment. In working with soldiers and existing weapon systems in a motor pool, training, or deployment environment, the engineer gains a better sense of how equipment is used, what problems a field tactical environment causes, and what type tasks/jobs soldiers are capable of performing. This action should be taken to educate both government and contractor design engineers.

Resources Cost estimate: $200 K

Time to Complete This activity should occur six months to one year before functional configurations begin to emerge. Execution timeframe: 1987 - 1988

Responsible Agency AMC/TACOM

Support Agency CAC

Task Flow Dependencies -
Feeds -

Generating MANPRINT Question:

Status

3. Task Description Early Comparability Analysis (ECA)
Rationale ECA identifies soldier tasks from current systems which are likely to be found in new (proposed) systems, then examines the ability of current soldiers to adequately execute these tasks. In this manner ECA flags current problem tasks which are likely to cause problems in new systems if not deleted or properly addressed in the new design. This analysis compliments HARDMAN. Due to funding constrains, ECA priorities have been established for the program.

Resources TBD

Time to Complete ECAs must be executed as soon as current systems and subsystems related to the new system have been

identified. Priority of resources to band 1 activities. Execution timeframe: 1986 - 1993

Responsible Agency CAC

Support Agency Variant (subsystem) Proponents, SSC-NCR

Task Flow

Dependencies - Predecessor/Reference system Data
Feeds - ROC, RFP, HFEA, PTEA

Generating MANPRINT Question:

Status

4. Task Description HARDMAN/MIST Analysis

Rationale The HARDMAN/MIST (Hardware versus Manpower Analysis/Man Integrated System Technology) analysis methodology provides estimates of the manpower, personnel, and training requirements associated with a proposed weapon system. The basic analytic approach used is comparability, the extrapolation of the likely demands of new systems based on knowledge of existing systems and the expected magnitude of technological change in moving from one generation of a technology to the next. HARDMAN/MIST contributes to the affordability assessment of a proposed system. The primary focus of HARDMAN/MIST is the equipment "slice." Data preparations to support HARDMAN/MIST should occur prior to the analysis initiation. If a new Sample Data Collection (SDC) must be requested to provide the program with necessary data on an existing system, then this request normally is submitted roughly two years prior to the HARDMAN/MIST Analysis initiation date. If technology developers are expected to provide certain types of information, then they should be notified well in advance, and told the types of information they will be expected to provide.

Resources $250K estimated per application.

Time to Complete A HARDMAN/MIST analysis must be initiated during early Proof of Principle as functional configurations begin to emerge. Execution timeframe: 6 months per aplication.

Responsible Agency CAC/TRAC-WSMR

Support Agency SSC-NCR, ARI, HQ TRADOC, Proponents

Task Flow

Dependencies - predeceswsor, reference data, contractor data
Feeds - HFEA, ROC, CTEA, RFP

Generating MANPRINT Question:

Status

5. Task Description Human Factors Engineering (HFE) Design Effort

Rationale The HFE design effort is a component of the overall system design. Human factors must receive attention comparable to the other design factors. Design decisions must be made with an understanding to their impact on human needs, capabilities, limitations, and mission requirements. CAD systems assist in this process by permitting human factors engineers to operate directly in the design process. Prime managers must show solid proof that human factors concerns are being thoroughly integrated during design. Formal records of the HFE trade-offs considered and their ultimate resolutions must be maintained.

Resources $50 K (for trade-off audit trails; remaining costs are part of system design)

Time to Complete HFE design effort should begin at the same time that other design actions begin, and should be an integral part of the overall design process throughout the entire AFV acquisition process. Execution timeframe: 1986 - 1990.

Responsible Agency TACOM/HEL

Support Agency

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

6. Task Description Human Performance Requirements Estimation

Rationale Estimates of human performance requirements must be generated as soon as functional configurations begin to emerge. A serious effort will be made to ensure that the human performance requirements do not exceed the capabilities of the target audience. Moreover, an effort to ensure that the demands are within the capabilities of the average soldier must be made. Unrealistic demands will precipitate design or concept changes.

Resources $150 K.

Time to Complete Human performance requirements analysis should begin as soon as a system functional configuration emerges. Continuous reassessment of the performance requirements should continue throughout the concept exploration phase. Execution timeframe: 1987 - 1991

Responsible Agency CAC/HEL

Support Agency Proponent Schools, SSC-NCR, ARI

Task Flow

Generating MANPRINT Question:

Status

7. Task Description Maintainability Analysis

Rationale This analysis or set of analyses identifies maintainability problems associated with current systems which should be avoided in AFV. This includes such concerns as poor accessibility for components which fail frequently, designs which tend to produce a high incidence of maintainer induced failures, component-system interface connection mechanisms which consume excessive amounts of maintainer time or energy, and designs which place the maintainer in positions which rapidly fatigue him. Findings from other analyses, such as ECA, will feed the maintainability analysis. Models emerging under the CAD system which will allow one to do relatively sophisticated maintainability examinations rapidly will be used. The most effective way to influence design would be to put CAD-based maintainability models on the prime contractor's CAD system and have his design engineers or human factors specialists use it as part of the configuration management process. Records must be kept of the maintainability concerns considered.

Resources $250 K.

Time to Complete Histories of problems should be gathered as soon as subcomponents are identified which are likely to be included in AFV chassis. CAD-based analytic procedures must await the initial development of CAD-based design configurations. Execution timeframe: 1988 - 1989.

Responsible Agency LOGCEN

Support Agency HEL, TACOM

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

8. Task Description Maintenance Troubleshooting Requirements Analysis and Maintenance Concept Impacts on Workload.

Rationale This action refers to an analysis or set of analyses which define what can realistically be expected of BIT/BITE/ATE, prognostic test equipment, and other maintenance aiding devices (e.g. electronic notebooks, expert systems). The goal is to understand what maintenance troubleshooting responsibilities will continue to reside with the soldier, what troubleshooting will be handled by the various devices, and the extent to which these devices are likely to be available when the soldier needs them. The goal is to understand the troubleshooting workload and the skill levels this troubleshooting will require as a function of the system and the maintenance concept to be employed.

Resources $300 K.

Time to Complete The general model for doing this analysis could be generated at any time. It could then be revised as AFV specific data becomes available: Execution timeframe: 1989 - 1990

Responsible Agency LOGCEN

Support Agency TACOM

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

9. Task Description Manpower Resource Analysis

Rationale This analysis determines the manpower boundary conditions for proposed AFV systems based on assessments of manpower distributions associated with predecessor (replaced) system. The goal of this analysis is to set clear, measurable boundaries so that the proposed system demands relative to this boundary can be assessed. The boundary itself may be treated as either a goal or a requirement depending on the guidance delivered to the program. The objective is to see that the proposed system demands do not exceed the boundary. Findings from other analyses, especially ECA, will feed this effort.

Resources $50 K.

Time to Complete Timing: This analysis must be done during Technical Base Activities Phase. It requires only a clear statement of the systems to be replaced. Execution timeframe: Jan 86 - Mar 88.

Responsible Agency CAC

Support Agency ARI, SSC-NCR

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

10. Task Description MANPRINT Guidance Letter for Technology Developers

Rationale A letter explaining the MANPRINT information to be provided by each individual technology developer should be sent

to that developer soon after program initiation. This information, when delivered, will help to decide whether a particular technology is sufficiently mature to be installed in the system configuration, whether it should be held as part of the P3I program until it matures, or whether it should be eliminated from consideration. A small project should be undertaken to determine what information should be delivered. The elements to be delivered should be standardized and have sound operational definitions.

Resources $1.0 K.

Time to Complete This should be done as quickly as candidate technologies can be identified. The earlier, the better. Execution timeframe: 1986

Responsible Agency AMC

Support Agency AMC Subordinate Materiel Commands, LABCOM, TISG

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status: Action has been completed.

11. Task Description Mission Simulations for Crews

Rationale A system will be established to simulate AFV missions for experimental crews with various crew skill, aptitude and experience mixes. It can be physical mock-up with electronic simulations of missions or perhaps existing systems can be modified to represent an AFV crew compartment and to simulate AFV missions. This system will be used to empirically refine the HFE design and to determine when workloads should be automated. It will also provide a means to examine the performance of crews composed of varying experience levels and intellectual capabilities. These exercises will identify the human performance which can be expected and the soldier characteristics necessary to provide that performance. Such an experimental system would also permit engineers and program managers to examine the impact on performance of different distributions of tasks across crew roles. More and less efficient distributions and blocks of tasks will be discovered.

This is a logical spinoff of Crew Compartment Concept Exploration and should include lessons learned from similar efforts in the LHX (ARTI) programs, as well as input from the use of the TACOM Vetronics Crew Display Demonstration.

Resources $1,000 K.

Time to Complete This activity should be initiated quickly once a functional configuration has been established. It is assumed that adequate mission descriptions exist in the Organizational and Operational Plan or can be derived. Execution timeframe: 1987 - 1990

Responsible Agency CAC

Support Agency HEL/TACOM/LABCOM

Task Flow

Dependencies -
Feeds - DTEA, HFEA

Generating MANPRINT Question:

Status

12. Task Description Organizational Modeling Analysis

Rationale An analytic model of the organization which enables combat developers to examine the impact of varying distributions of manpower on the unit's mission capability. This modeling also supports the examination of manpower demands under different maintenance concepts. This type of analysis is relatively data intensive. Coordination with other analyses, such as HARDMAN, should occur in order to minimize data search time and costs, and to insure consistency of assumptions.

Resources $300 K.

Time to Complete This analysis should be initiated as functional configurations of the proposed system emerge. (The O&O Plan has already been developed.) Execution timeframe: 1987 - 1991

Responsible Agency CAC

Support Agency NONE

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

13. Task Description Contractor MANPRINT Capability Assessment Rationale A management tool to be used by the Army to assess the MANPRINT knowledge and capabilities of the prime contractors. It consists of a set of system specific MANPRINT questions which the contractors must answer. The Army evaluates the quality of the responses and provides feedback to the contractors. This action serves two purposes. It provides Army program management with insight into the MANPRINT capabilities of the specific contractors and it provides contractors with feed back on the areas in which they are considered weak by the government. If executed with sufficient lead time, it permits prime contractors to make the necessary management adjustments and serves as a way for Army management to influence prime contractor management.

Resources $0.2K.

Time to Complete This analysis should be initiated when candidate prime contractors emerge and a reasonable list of specific questions can be generated. Execution timeframe: 1986 - 1989

Responsible Agency AMC

Support Agency TACOM/ARI

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

14. Task Description Requests for New Sample Data Collection (SDC)

Rationale SDC is the Army's system for collecting field data on the reliability and maintainability of its equipment. New data collections are triggered through formal requests to AMC. Field data on existing systems are of value to the AFV program in gaining insight into the likely performance of a new (proposed) system. This data is important for both HARDMAN/MIST and Organizational Modeling Analyses. The key action here is to identify the relevant existing data and identify data gaps which require new SDC efforts.

Resources $10K.

Time to Complete A request for an SDC should precede the initiation of the HARDMAN/MIST and Organizational Modeling Analysis. Execution timeframe: 1987-1988

Responsible Agency AMC

Support Agency NONE

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

16. Task Description Robotics Impact Studies

Rationale HEL will undertake a series of studies in the 1987 to 1988 timeframe to examine the potential utility of robotics for battlefield automation. To the extent that these projects are successful they will eliminate certain types of human workload (operator efforts) and create other workloads (maintenance burdens associated with robots). These projects must be closely monitored and their results fed to other analyses (e.g. HARDMAN and Organizational Modeling) to ascertain the impact of robotics on the system manpower and training requirements.

Resources NONE - HEL R&D effort, part of HEL program, no cost to AFV program

Time to Complete These projects are scheduled to begin in 1987. They are not directly dependent on any AFV actions. Execution timeframe: 1987 - 1988.

Responsible Agency HEL

Support Agency NONE

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

16. Task Description Combat Leader Role Change Study

Rationale Under emerging tactical doctrines and dispersed battlefield concepts the AFV units will operate in an autonomous or a semi-autonomous manner. This dispersion clearly puts greater responsibility on leaders for communications actions, leadership, combat initiative, and crew safety. A thorough study must be conducted which will fully identify any new aptitudes or new skills required. This study is an ongoing effort in support of the AFAS (Advanced Field Artillery System) Program. The information from this study must be broadened for AFV application and then be provided to the recruiting and training communities.

Resources $200 K.

Time to Complete Planning for this project should be initiated immediately and integrated into other combat effectiveness models.
Execution timeframe: 1987-1988.

Responsible Agency CAC

Support Agency ARI

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

17. Task Description Training Concept Development

Rationale The training concept envisioned for AFV must reflect the goals, assumptions, and constraints that are desired and/or necessary for the training system. It should describe in broad terms how initial, collective, transition, and sustainment training are to be accomplished for operator, maintainer, and support personnel. It should tentatively identify the proponent agencies for the development of the training, identify the level of cost impact envisioned to accomplish the training, as well as estimate anticipated requirements for New Equipment Training (NET) and NET Teams, conducted under the auspices of the Preliminary Training Effectiveness Analysis.

Resources $341 K.

Time to Complete The training concept development must begin to be articulated at an early stage of the development process. Execution timeframe: Jan 86 - Mar 88.

Responsible Agency CATA

Support Agency CATA, ATSC, PM TRADE, ARI

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

17a. Task Description Training Analysis

Rationale A Front End Analysis to assist in determining training requirements and possible straining deficiencies. Primary Objectiveds are to:

a. Define and develop alternative traiing sysstem concepts.

b. Determine training styrategy and selection criteria. Functional tasks and task groupings, and ssuppporting alternative device and embedded training Implementation plan(s) shall be documented for each afv type (heavy, medium, and light).

Resources $250 K

Time to Complete Aug 87

Responsible Agency PM TRADE

Support Agency ARI

Task Flow

Dependencies -)&) Plan, STRAP, SMMP
Feeds - AFV System PMD, STRAP, IEP

Generating MANPRINT Question:

Status

18. Task Description Training Objectives Development

Rationale The training objectives, at the initial stage, are to be derived from the system definition's functional allocation. As the tasks to be assigned to human performance are defined, they can be provisionally assigned to job clusters, duty positions, and hence, MOSs. This provides the initial task groupings used in deriving the training objectives. The tasks must then be analyzed for skill components that are tentatively assigned to an "assumed possessed" or "to be trained" category, with the latter forming the basis for training objective specification.

Resources $75 K. each

Time to Complete Training objective development should begin as soon as the system definition's functional allocation emerges. Execution timeframe: 1988.

Responsible Agency CAC

Support Agency ARI, TRADOC schools, CATA

Task Flow

Dependencies -
Feeds - STRAP

Generating MANPRINT Question:

Status

19. Task Description Training Strategy Development

Rationale Once the tentative training objectives are defined, comparisons can be made with existing training capabilities to estimate the scope of the new requirements, such as embedded training. The training strategy is then developed to describe how the training objectives might be accomplished. This analysis will describe what changes are to be made in the MOS producing courses, location of training for each of the types of training, and what new technologies could be employed to increase training effectiveness. It would take into consideration the current quality of soldier populations in each level of training and estimate their ability to meet the new requirements. It should identify and potential problem areas and suggest what actions are required to overcome them. Upon completion of the development of the training strategy, there will be a baseline plan for the accomplishment of required training from which deviations can be made as system design dictates, or more importantly, which can be used to identify points at which system design exceeds reasonable training system capabilities.

Resources $600 K.

Time to Complete Training strategy development should begin as soon as the tentative training objectives are defined and comparison is made with the existing training system. Execution timeframe: 1988 thru 1992.

Responsible Agency CAC

Support Agency ARI

Task Flow

Dependencies -
Feeds - STRAP, DTEA

Generating MANPRINT Question:

Status

20. Task Description Crew Workload and Performance Modeling

Rationale With detailed mission description information and proposed preliminary vehicle design configurations crew tasks can be defined and mission workload and performance can be examined. This type of modeling analysis permits mission performance to be examined as a function of the soldier to whom the task is assigned. This type of computer-based analysis aids the later mission simulations for test crews by helping to identify task assignment structures which are likely to be successful.

Resources $500 K.

Time to Complete This analysis should be initiated as soon as a detailed mission description can be found or generated and a rough functional configuration can be identified., Execution timeframe: 1988 - 1989.

Responsible Agency CAC

Support Agency TACOM/HEL/ARI

Task Flow

Dependencies -
Feeds - DTEA, HFEA

Generating MANPRINT Question:

Status

21. Task Description Human Factors Engineering Analysis (HFEA)

Rationale This umbrella HFEA covers the general AFV chassis systems relevant issues.

Resources $75 K.

Time to Complete 6 months

Responsible Agency HEL

Support Agency AEHA, TRADOC, Safety Center

Task Flow

Dependencies - HARDMAN/MIST, ECA, HFE, HHA, SSA
Feeds - DTEA, STRAP

Generating MANPRINT Question:

Status

22. Task Description Health Hazard Assessment (HHA). This analysis applies biomedical and physiological knowledge and principles to identify, evaluate, and eliminate or control existing or likely conditions inherent to the operation or use of AFV systems that can cause death, injury, acute or chronic illness, disability or reduced job performance by exposure of personnel to conditions knowing to be harmful to humans, (such as excessive noise, vibration, etc). The goal is to attain the optimum degree of health features in a system within bounds of costs, operational effectiveness and time.

Rationale

Resources $50 K.

Time to Complete A Health Hazard Assessment Analysis should be initiated during concept exploration as functional configurations begin emerge. Execution timeframe: 1987 - 1991.

Responsible Agency OSG

Support Agency HEL, HSC

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

23. Task Description System Safety Assessment (SSA)

Rationale This assessment identifies and eliminates hazards in the system that might affect performance directly or indirectly through injury to the crew or maintainers. Injury can occur as a result of poor design, equipment failure or human error, such as an injury from the recoil of gun in a crew compartment. The goal of the assessment is to attain the optimum degree of safety features for a system within the bounds of operational effectiveness, time, and cost.

Resources $50 K.

Time to Complete A System Safety Assessment should be initiated during Technical Base Activities as functional configurations begin to emerge. Contractors should be addressing safety concerns on a continuing basis as they develop their concepts. Execution timeframe: 1987 - 1989.

Responsible Agency AMC

Support Agency US Army Safety Center (USASC), Army Safety Office (ASO), TACOM

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

24. Task Description Manpower Cost Analysis

Rationale This analysis will make use of the Army Manpower Cost System to estimate the personnel costs in dollars associated with AFV. This system will provide realistic, standardized costs for personnel aspects of AFV. This standardization will permit fair comparisons between various parts of the AFV system and will support sound comparisons between various proposed configurations. This analysis will provide the estimate of the personnel component of life cycle cost.

Resources $80 K.

Time to Complete A first pass of this analysis can be initiated as soon as manpower estimates can be generated and a system life cycle duration is projected. Execution timeframe: 1989 - 1991.

Responsible Agency CAC

Support Agency SSC, ARI

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

25. Task Description MOS Impact Estimation. (TBP)

Rationale

Resources

Time to Complete

Responsible Agency

Support Agency

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

26. Task Description Soldier (Target Audience) Descriptions. (TBP)

Rationale Identify soldier data to industry.

Resources

Time to Complete 6 months

Responsible Agency Proponent Schools

Support Agency SSC-NCR

Task Flow

Dependencies -
Feeds - DTEA

Generating MANPRINT Question:

Status

27. Task Description AFV Human Performance File

Rationale This project will collect AFV relevant human performance data. The major risk areas which have been identified are 1) encapsulation, 2) information processing (overload), 3)maintenance trouble-shooting complexity, and 4) realistic doctrine and battlefield security. This project will gather the currently available information, organize it to address AFV concerns, and structure it for briefings.

Resources $170K

Time to Complete 8 months

Responsible Agency ARI

Support Agency HEL, OSG, SSC-NCR, TRAC, AFVTF, CAC, NTC

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

28. Task Description Training Requirements for Future Integrated Battlefield

Rationale This program is designed to determine the soldier performance decrements resulting from enemy threat systems and the soldier performance impacts of counter-measure activities (technology and training) necessary to offset those decrements. Simulation systems will be used to determine the impact of threats and counter-measure technology on soldier performance. The simulation efforts will examine the impact on performance of an NBC environment and of emerging technologies (e.g. CITV, POSNAV, BMS, V(INT)2, etc.) designed to support the weapon crew in their mission execution.

Resources $9500K (FY 87 - FY92)

Time to Complete 6 years

Responsible Agency ARI

Support Agency US Armor Center, AFVTF, HEL, CATA, USAIS

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

29. Task Description Systematic Organization Design (SORD)

Rationale SORD is a computer-based system being built to assist in the design of units of the Army in the field. SORD's purpose is to make it possible for a user, charged with designing a unit for a stated mission, to follow a logical and orderly process, laid out in software and supported by a computerized data base, that will produce an optimum unit design in terms of personnel, major equipment systems, and organizational structure/command and control. It is a hardware/software system with four subsystems and an introductory module. The first three subsystems match the three steps of systematic organization design: (1) understand the unit's reason for being, its setting, and how it is to operate; (2) design a trial unit; (3) test and evaluate the unit design; and recycle. The fourth SORD subsystem is the Crew Design Subsystem (CDS). Its purpose is to assist the user in defining an optimum crew for a crew-served material system. The product is then used in the Unit Design Subsystem. This system will assist

Combat Developers in the design of units, and maintain audit trails of the rationales behind the units designs. The system will aid AVF in the design and refinement of O&O plans. The SORD prototype system is to be tested in FY88 and FY89 in real weapon development programs; selection of the specific programs will be coordinated with the AFV Program.

Resources $1275K (FY87 - FY89)

Time to Complete 3 YEARS

Responsible Agency ARI

Support Agency CAC, AFVTF, SSC-NCR

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

30. Task Description Impact of Equipment Commonality on MPT Resource Requirements

Rationale The Man Integrated Systems Technology (MIST) software system, an automated form of HARDMAN analysis, will be used to estimate the savings in MPT requirements resulting from the introduction of extensive commonality into combat units. The project will examine the impact of commonality for four major equipment subsystems (engine/transmission, fire control/target acquisition, driver's station, and suspension system) within a tank battalion. Specifically, for these four subsystems, the project will compare MPT demands of a current tank battalion (low degree of commonality) to: 1) a proposed future tank battalion with extensive commonality, and 2) a proposed future tank battalion with limited commonality. Manpower estimates will be converted to O&S costs through the use of the Army Manpower Costing System (AMCOS). The project will also assess the impact of commonality on a mechanized infantry battalion, if project resources permit.

Resources $350K

Time to Complete 1 year

Responsible Agency ARI

Support Agency AFVTF, TACOM, MRSA, LOGCEN, SSC-NCR, Proponents.

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

31. Task Description AFV Embedded Training (ET) Requirements and Design

Rationale This project will determine the embedded training requirements for the set of AFV variants, develop ET training and hardware/software configuration per variant, and incorporate the ET design into the specific variant designs. The project will establish the appropriateness of ET, the hardware and software requirements for ET, and the specific tasks to be trained per AFV variant.

Resources $4650K (FY87 - FY89)

Time to Complete 3 years

Responsible Agency PM TRADE

Support Agency AFVTF, Proponents, ARI, CATA

Task Flow

Dependencies -
Feeds - DTEA, ROC, TDR annexes, STRAP, HFEA

Generating MANPRINT Question:

Status

32. Task Description Controlling Operator Workload in Army Systems Design and Evaluation.

Rationale This project will validate operator workload measures on total type Army systems (e.g. tanks, helicopters) and use the results to develop handbooks directed at controlling operator workload in new Army systems. The handbook will be written for application to Army systems at all stages in the development cycle and will include the impact of all critical operational considerations (threat, environment, doctrine, etc.).

Resources $1500K (FY87 - FY89)

Time to Complete 3 Years

Responsible Agency ARI

Support Agency AFVTF, HEL, Appropriate PM offices, Proponents

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status -

33. Task Description Crew Performance Assessment Capability (CPAC).

Rationale CPAC is a computer simulation/modeling tool used to estimate crew performance capabilities as a function of crew size, task assignment, and various forms of degradation. It simulates important characteristics of a crew performing system tasks throughout a period of continuous operations. The tool incorporates algorithms to predict the degradation consequences of the change in heat stress, and aids in estimating the essential crew size necessary to support continuous operations, without suffering significant fatigue related performance degradation.

Resources $60K (FY88, FY89, for travel)

Time to Complete 3 years FY87 - FY89)

Responsible Agency ARI

Support Agency AFVTF, Armor Center, TACOM, HEL, FA Center

Task Flow

Dependencies -
Feeds - HFEA

Generating MANPRINT Question:

Status

34. Task Description Army Manpower Costing System (AMCOS)

Rationale This system provides the AFV COEA with appropriate manpower cost information as derived from the AMCOS system of models. AMCOS is designed to provide accurate estimates of life cycle manpower costs for current and future weapons.

Resources $1092K (FY87 - FY91)

Time to Complete 5 Years

Responsible Agency ARI

Support Agency CEAC, AFVTF, HQ TRADOC, DCSPER, COA

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

35. Task Description Vehicle Integrated Intelligence Technology Maturation (V(INT)2) for AFV Implementation

Rationale V(INT)2 is a "smart" system designed initially for tank platoon leaders. It will filter and tailor the type, amount, and format of incoming data to provide critical combat engagement information. The ARI V(INT)2 demonstrator uses an integrated family of programs, that apply the "rule of warfare" based on expert protocols. Data include the ARTBASS version of digitized terrain, friendly and OPFOR doctrine, tactics, and other combat relevant information. A comprehensive soldier-machine interface

implemented in a laboratory setting, and the developmental SIMNET (SIMNET-D) at Fort Knox KY. will allow testing of innovative display concepts and technologies for selected tactical operations. Other actions which must be undertaken to fully develop V(INT)2 include tests to select a durable and easily used keyboard, development of a navigation display system which flags easily observable terrain features, and development of smaller and improved logistics/maintenance status systems. Because sensor systems and mapping inputs essential to the V(INT)2 system will not be ready until after FY89, the V(INT)2 technology will be part of the AFV P3I Program.

Resources $1500K (FY87 - FY90)

Time to Complete 4 Years

Responsible Agency ARI

Support Agency AFVTF, Armor Center, TACOM

Task Flow

Dependencies -
Feeds -

Generating MANPRINT Question:

Status

36. Task Description Develop AFV ROC

Rationale Required program document, due prior to MDR I/II

Resources Est. 10 man years, $500 K.

Time to Complete 1/2 years, Drafts due 26 Jun 87

Responsible Agency CAC

Support Agency AFVTF, Integrating Centers, Proponents

Task Flow

Dependencies - O&O Plan.
Feeds - LCSMM, RFP, other Acquisition Documents.

Generating MANPRINT Question:

Status

37. Task Description Develop Integrated Logistics Support Plan (ILSP).

Rationale ILS planning and MANPRINT planning both are concerned with soldier-machine interface. ILSP interface with MANPRINT is essential to avoid expensive duplication of efforts, and to assure that all required actions are taken.

Resources est. 6 man years, $225 K.

Time to Complete 1 year, 1st iteration

Responsible Agency CAC

Support Agency AFVTF, Integrating Centers, Porponents, AMC major commands.

Task Flow

Dependencies - O&O Plan
Feeds - ROC

Generating MANPRINT Question:

Status

38. Task Description AFV Notional Force Study

Rationale To provide a mechanism to analyze alternative personnel structures in terms of MOS and grade for the AFV force.

Resources In house effort

Time to Complete 4 months

Responsible Agency SSC-NCR

Support Agency AFVTF

Task Flow

Dependencies -
Feeds - MLPRS Study and MPT study

Generating MANPRINT Question:

Status

39. Task Description Develop and update the SMMP

Rationale The SMMP is the mechanism used to document, track, and integrate the overall MANPRINT strategy for the Program, and all of its variants.

Resources In house Effort

Time to Complete The effort is ongoing, the document will be under constant revision.

Responsible Agency CAC

Support Agency SSC-NCR (maintains the data base), AFVTF, Proponents, any other action agency.

Task Flow

Dependencies -
Feeds - All MANPRINT activites, especially the O&O plans, and the ROC

Generating MANPRINT Question:

Status

40. Task Description Individual and Collective Training Planning (ICTP)

Rationale To document all formalized planning for the AFV Training Effort.

Resources In house Effort

Time to Complete 9 months (1st iteration)

Responsible Agency CAC

Support Agency all agencies supporting the AFV effort input to this plan.

Task Flow

Dependencies -
Feeds - All training documentation, and the testing effort.

Generating MANPRINT Question:

Status

(U) POINT OF CONTACT LISTING
(This Annex Is Unclassified)

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
AFVTF Director, AFV Task Force Ft. Eustis, VA 23604-5597			
MAJ Joseph Fil	MANPRINT	DAMO-AFV-C	AV 927-1463/1464
LTC Tom Rozman	Training/Testing	DAMO-AFV-C	AV 927-1463/1464
CPT Carlton Smith	ILS/LSA	DAMO-AFV-C	AV 927-1463/1464
Mr. Fred Phalin	MANPRINT	DAMO-AFV-C	AV 927-1463/1464
DA DCSPER HQ DA Washington DC 20310-0300			
LTC Keith Fender	MANPRINT	DAPE-MR	AV 225-9213
Ms Marjorie Zelko	MANPRINT	DAPE-MR	AV 225-9213
LTC Bill Feyk	PERSSO	DAPE-MBI-CO	AV 227-2221/0575
TRADOC HQ HQ US Army TRADOC Ft. Monroe, VA 23651-5000			
CPT J Hines	Training Development	ATTG-YC	AV 680-3835/3836
Ms Susie Swafford	MANPRINT	ATCD-SP	AV 680-4225
AMC HQ HQ US Army Materiel Command 5001 Eisenhower Ave. Alexandria, VA 22333-0001			
Mr. Herman Tarnow	AMC Lead	AMCDE-PQA	AV 284-5695/5697
Ms. Rocky Nelson	HQ AMC Alternatve	AMCDE-PQA	AV 284-5696/5697

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
CACDA Cdr, Combined Arms Combat Development Activity Ft. Leavenworth, KS 66027-5300			
Mr. Robert Buckingham	CAC Lead	ATZL-CAM-I	AV 552-2096/2235
Mr. Ben Stutler	CAC Alternate	ATZL-CAM-I	AV 552-2096/2235
LTC Michael Colacicco	MANPRINT/ILS	ATZL-CAM-O	AV 552-3294/3489
Mr. Don Timmons	MANPRINT	ATZL-CAM-O	AV 552-3294/3489
Mr. Ron Myers	ILS/LSA	ATZL-CAM-O	AV 552-3294/3489
Mr. Harold R. Hodges	Force Development	ATZL-CAF-D	AV 552-2698
CATA Cdr, Combined Arms Training Activity Ft. Leavenworth, KS 66027-7000			
MAJ Bob Poynter	Training Development	ATZL-TAS	AV 552-2495/3445
CPT William Derr	Training Development	ATZL-TAS	AV 552-2495/3445
CPT Kelly Mayes	Training Development	ATZL-TAS	AV 552-2495/3445
TIED DCG TRADOC Ft. Leavenworth, KS 66027-5300			
Mr. John McKinney	Independent Evaluation	ATZL-TIE-C	AV 552-3022
LOGCEN Cdr, US Army Logistics Center Ft. Lee, VA 23801-6000			
Mr. Bill Moore	ILS/LSA	ATCL-MGM	AV 687-4136
Mr. Isidro Gomez		ATZL-TAG	AV 687-2037/2038
SGM John Sloan	Logistics Training	ATZL-TAG	AV 687-2037/2038
Ms. Hope Van Alstine		ATZL-MRI	AV 687-2360/3659

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
SSC-NCR Commander, Soldier Support Center NCR 200 Stovall Street Alexandria, VA 22332-0400			
MAJ Dean De Vault	Lead	ATNC-NMM-A	AV 221-0946/0263
CPT Chuck Young	Alternate Lead	ATNC-NMM-A	AV 221-0946/0263
Ms Nina Richean-Loo	MANPRINT Policy	ATNC-NMF-B	AV 221-2092
Mr. Ray Brandenburg	ECA/HARDMAN Analysis	ATNC-NMF-C	AV 221-0242
MAJ Greg Citizen	Target Audience Description	ATNC-NMF-A	AV 221-0272
CPT Mike Hiemstra	Notional Force Analysis	ATNC-FPD	AV 221-2069
DTPDC Defense Training and Performance Center XXX Progress Drive Orlando, FL 32826-3229			
Ms. Kris Hoffman	MANPRINT Data	TE DIV	Comm (305)281-3643
ARI CDR, US Army Research Institute 5001 Eisenhower Ave Alexandria, VA 22333-5600			
Dr. Christine Hartel	HFE	PERI-SM	AV 284-8905
INFCEN Cdr, US Army Infantry School Ft. Benning, GA 31905-5400			
Mr. Sherman Copley	Combat Development	ATSH-CD-MLS-M	AV 835-1644/1618
Mr. Chuck McIntosh	Combat Development	ATSH-I-V-A	AV 835-3022/5674

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
ARMCEN Cdr, US Army Armor School Ft. Knox, KY 40121-5215			
Mr. Dennis Lipscomb	Combat Development	ATSB-CD-ML	AV 464-1250/7222
MAJ Bill Gehr	Combat Development	ATSB-CD-MLD	AV 464-5574
FAS US Army Field Artillery School Ft. Sill, OK 73503-5000			
MAJ (P) Bill McGrew	FAS Lead	ATSF-CML	AV 639-2045
Ms. Rose Ann Griffin	CD	ATSF-CML	AV 639-2045
Mr. Al Daly	Combat Development	ATSF-DVS	AV 639-3879
ENGCEN Cdr, US Army Engineer Center Ft. Belvoir, VA 22060-5261			
Mr. Chuck Manning	Combat Development	ATZA-CDM	AV 354-3712
Mr. Jose Constantino	Combat Development	ATZA-CDM	AV 354-3712
ADACEN Cdr, US Army Air Defense Artillery School Ft. Bliss, TX 79916-5000			
CPT Brad Jenison	Combat Development	ATSA-CDM-L	AV 978-5012/5144
CPT Ernest T. Buchanan	Training Development	ATSA-DTN-SY	AV 978-2556
Ms. Kay Castillo	Training Development	ATSA-CDM-L	AV 978-5012/5144
AHS Cdr, Academy of Health Sciences Ft. Sam Houston, TX 78234-6000			
MAJ Tim Connor	Combat Development	HSHA-CDM	AV 471-7151

POINT OF CONTACT LISTING

ACTIVITY MAILING ADDRESS POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
CMLS Cdr, US Army Chemical School Ft. McClellan, AL 36205-5000			
CPT Steve Kelly	Combat Development	ATZN-CM-CD	AV 865-3906
Mr. John Champion Jr.	Combat Development	ATZN-CM-CS	AV 865-5569
Mr. Jim Barber	Combat Development	ATZN-CM-FU	AV 865-4779
ICSH Cdr, US Army Intelligence School Ft. Huachuca, AZ 85613-7000			
Mr. James Gilbart	Combat Development	ATSI-CD-MD	AV 879-2208
CPT Foutopoulos	Combat Development	ATSI-CD-ML	AV 879-3022/2091
ICSD Cdr, US Army Intelligence School Ft. Devens, MA 01433-6301			
MAJ Joe Lalande	Combat Development	ATSI-ETD-NT	AV 256-3588
MMCS Cdr, US Army Ordnance Missile Munitions School Redstone Arsenal, AL 35898-5000			
Mr. John Caulkins	Combat Development	ATSK-TX	AV 746-3540
Mr. Dwight Bass	Combat Development	ATSK-CMA	AV 746-7408/1476
ORDCEN Cdr, US Army Ordnance Center & School Aberdeen Proving Ground, MD 21005-5201			
MAJ Michael Leibel	ORDCEN Combat Development	ATSL-CD-MS	AV 298-3375/4569
Mr. Arthur Mayfield	OrdCen Training Development	ATSL-TD-NE	AV 298-3315

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
Cdr, US Army Military Police School Ft. McClellan, AL 36205-5000			
MAJ David Dlugolenski	Combat Development	ATZH-MP-CD	AV 865-3016/3352/5328
CPT Dorthea Burke	Combat Development	ATZH-MP-DUE	AV 865-4797/3226
QMS Cdr, US Army Quartermaster School Ft. Lee, VA 23801-5000			
MAJ Dan Duhan	Combat Development	ATSM-CDM	AV 687-5466
TRANCEN - Cdr, US Army Transportation Center Ft. Eustis, VA 23604-5394			
CPT Cynthia Usher	Combat Development	ATSP-TDN	AV 927-6465
SIGCEN Cdr, US Army Signal Center Fort Gordon, GA 30905-5000			
Mr. Morgan Allen	Combat Development	ATZH-CDL	AV 780-7107/3129
SAFETY CEN Cdr, US Army Safety Center Fort Rucker, AL 36352-5000			
MAJ Dewey Webb	Safety	PESC-SE	AV 558-3943

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
TACOM Cdr, US Army Tank and Automotive Command Warren, MI 48397-5000			
Mr. Nabih Rizk	Materiel Development	AMSTA-HC	AV 574-6874
MRSA Cdr, Materiel Support Readiness Activity Lexington, KY 40511-5101			
Mr. Greg Tarver	ILS/LSA	AMXMD-EL	AV 745-3963
Mr. Jimmy Hill	ILS/LSA	AMXMD-EL	AV 745-4113
Mr. Ellis Atkinson	ILS/LSA	AMXMD-EL	AV 745-3963
Mr. Dave Hendricks	ILS/LSA	AMXMD-EL	AV 745-3963
Mr. Ray Cronk	ILS/LSA	AMXMD-EI	AV 745-4154
Mr. Phil Brooks	ILS/LSA	AMXMD-ED	AV 745-4177
PMTRADE US Army Project Manager for Training Devices Orlando, FL 32813-7000			
Mr. Robert Dybas	Training Development	AMCPM-TND-EC	AV 791-5043
Mr. Phillip Sprinkle	Training Development	AMCPM-ARD	AV 791-4779
HEL Director, Human Engineering Laboratory Aberdeen Proving Ground, MD 21005-5001			
MAJ Dick Koffinke	HFE	SLCHE-CC	AV 298-5952
Mr. Mike Golden	HFE	SLCHE-FS-M	AV 298-5830
LABCOM Cdr US Army Laboratory Command 2800 Powder Mill Road Adelphia, MD 20783-1145			
Mr. Douglas Felker	MANPRINT Management	AMSLC-TP-AL	AV 290-3557

POINT OF CONTACT LISTING

ACTIVITY / MAILING ADDRESS / POINT(S) OF CONTACT	AREA OF INTEREST	OFFICE SYMBOL	TELEPHONE NO.
ARI-KNOX Army Research Institute Ft. Knx Field Unit Ft. Knox, KY 40121-5000			
Dr. Kathleen Quinkert	HFE/MANPRINT	PERK-IK	AV 464-6982/3450

ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

VOLUME VII

TEST AND EVALUATION

MASTER PLAN

31 AUGUST 1987

UNCLASSIFIED

ARMORED FAMILY OF VEHICLES

PROGRAM ELEMENT

****

SUBMITTED BY

Robert J Sunell 20 July 87

ROBERT SUNELL Date
Major General, USA
Director, Armored Family
of Vehicles Task Force

James E Drummond 21 July 8

JAMES E. DRUMMOND Date
Major General, USA
Commander Operational
Test & Evaluation

****

REVIEWED: _____ Date

TRADOC

REVIEWED: _____ Date

DR. Jay R. Sculley
Assistant Secretary of the Army (RDA)

****

APPROVED: _____

Director, Operational Test
and Evaluation

APPROVED: _____

Deputy Under Secretary of Defense
Research and Engineering (Test and
Evaluation)

UNCLASSIFIED

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TEST AND EVALUATION MASTER PLAN

ARMORED FAMILY OF VEHICLES

ADMINISTRATIVE INFORMATION

1. Program Title: Armored Family of Vehicles

2. Program Element NOS:

3. Formal Requirements Documents: (Currently available)

   a. JMSNS

   b. O&O Plans

4. Points of Contact:

Title	Name, Symbol, AUTOVON
Task Force Director, AFV	MG Sunell, DAMO-AFV, AV 927-1461
Chairman, AFV TIWG Deputy Director Materiel	COL Logan, DAMO-AFV-M, AV 927-1464
AMC, PA & T	COL Corbett, AMCQA-S, AV 284-8690
AMSAA	Mr. Hilkemeyer, AMXSY-RV, Mr. E. Christman, AMXSY-GA, AV 298-2091, 298-4107
TACOM	Mr. Iler, AMSTA-ZEA, AV 786-8598
TECOM	Mr. Harrington, AMSTE-TE-R, AV 298-2420
OTEA	LTC H. Grohman, CSTE-CA, AV 289-2306
TRADOC T & E DIR	Mr. D. Reich, ATCD-T, AV 680-4251
TRADOC System Staff Officer, AFV	Mr. W Jones, ATCD-MH, AV 680-2306
CAC	Mr. R Buckingham, ATZL-CAM, AV 552-2096
Project Officer, ILS	CPT Smith
PO, C^3	MAJ Buckstad
PO, Testing	Mr. Robert Nette

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PART I

(U) SYSTEM DETAILS
(This Section Is Unclassified)

1. MISSION DESCRIPTION.

The Army has identified the need for a family of armored vehicles that employs advanced technology while emphasizing modularity, component commonality, and multiple systems capabilities. The AFV will be designed to defeat the threat of the late 1990's and beyond and is seen as a replacement for some 15 systems managed or under development. This program will ensure the Army has an enhanced battlefield capability while reducing training and logistical requirements. The family will fill the Army's close combat heavy assault, combat support and service support vehicular requirements from 1995 into the first three decades of the 21st century. The specific mission areas and roles are defined in the JMSNS and O&O Plans. The following specific mission roles are listed as they are envisioned to result in a vehicle or sub-system. This reflects most accurate data presently available. Actual characteristics of the individual sub-systems will continue to develop as O&O plans evolve and a Best Technical Approach (BTA) is established. Descriptions will be refined in each successive stage of acquisition as the program becomes more defined.

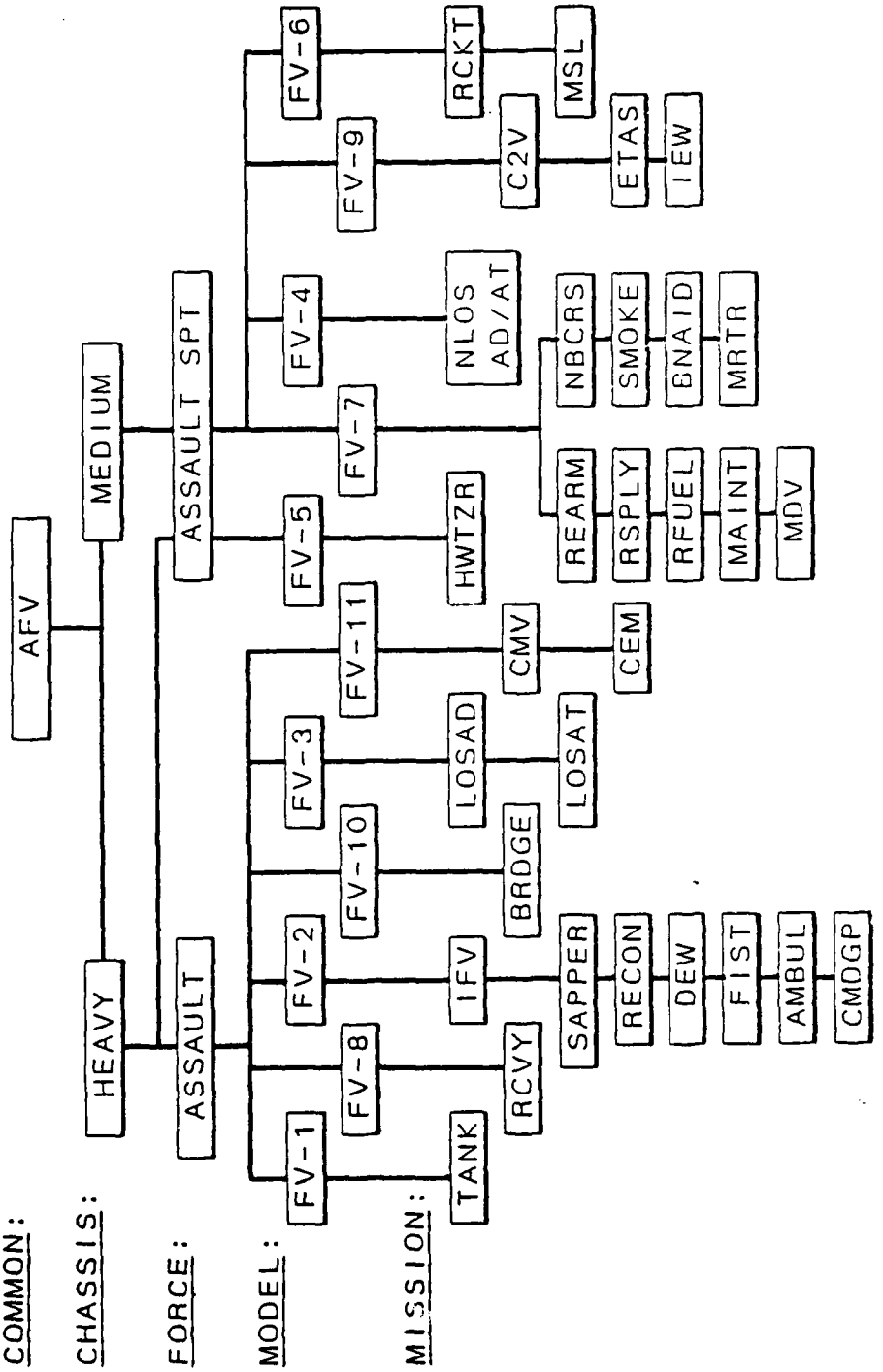
(1) Future Armored Combat System (FACS).
(2) Future Infantry Fighting Vehicle (FIFV).
(3) Future Reconnaissance Vehicle (FRV).
(4) Directed Energy Weapons Vehicle (DEW-V).
(5) Mortar Weapon System Vehicle (MWS-V).
(6) Advanced Field Artillery System-Cannon (AFAS).
(7) Fire Support Combat Observation (FSCOLS).
(8) Elevated Target Acquisition System (ETAS).
(9) Armored Rearm System. ┐
(10) Armored Refuel System. ├ Arm. Resupply Veh.
(11) Armored resupply System ┘
(12) Nuclear, Biological, and Chemical Reconnaissance (NBCRS)
(13) Sapper (SFV)
(14) Combat Earthmover (CEM)
(15) Combat Mobility vehicle
(16) Combat Gap Crosser
(17) Combat Excavator
(18) Mine Dispensing Vehicle
(19) Recovery Vehicle (RV)
(20) Maintenance and Repair System

(21) Intelligence and Electronic Warfare Vehicle
(22) Combat Support Smoke Vehicle (CSSV).
(23) Armored Escort/Security Vehicle (AE/SV)
(24) Armored Ambulance (AA).
(25) Battalion Aid Station/MEDEVAC.
(26) Line of Sight-AntiTank (LOS-AT).
(27) Line of Sight-Air Defense (LOS-AD).
(28) Non-Line of Sight (NLOS-AT/AD).
(29) Non-Line of Sight (NLOS-AT/AD).
(30) Command Group Vehicle (GCV).
(31) Command and Control Vehicle (C2V).
(32) Rocket and Missile System (RAMS).

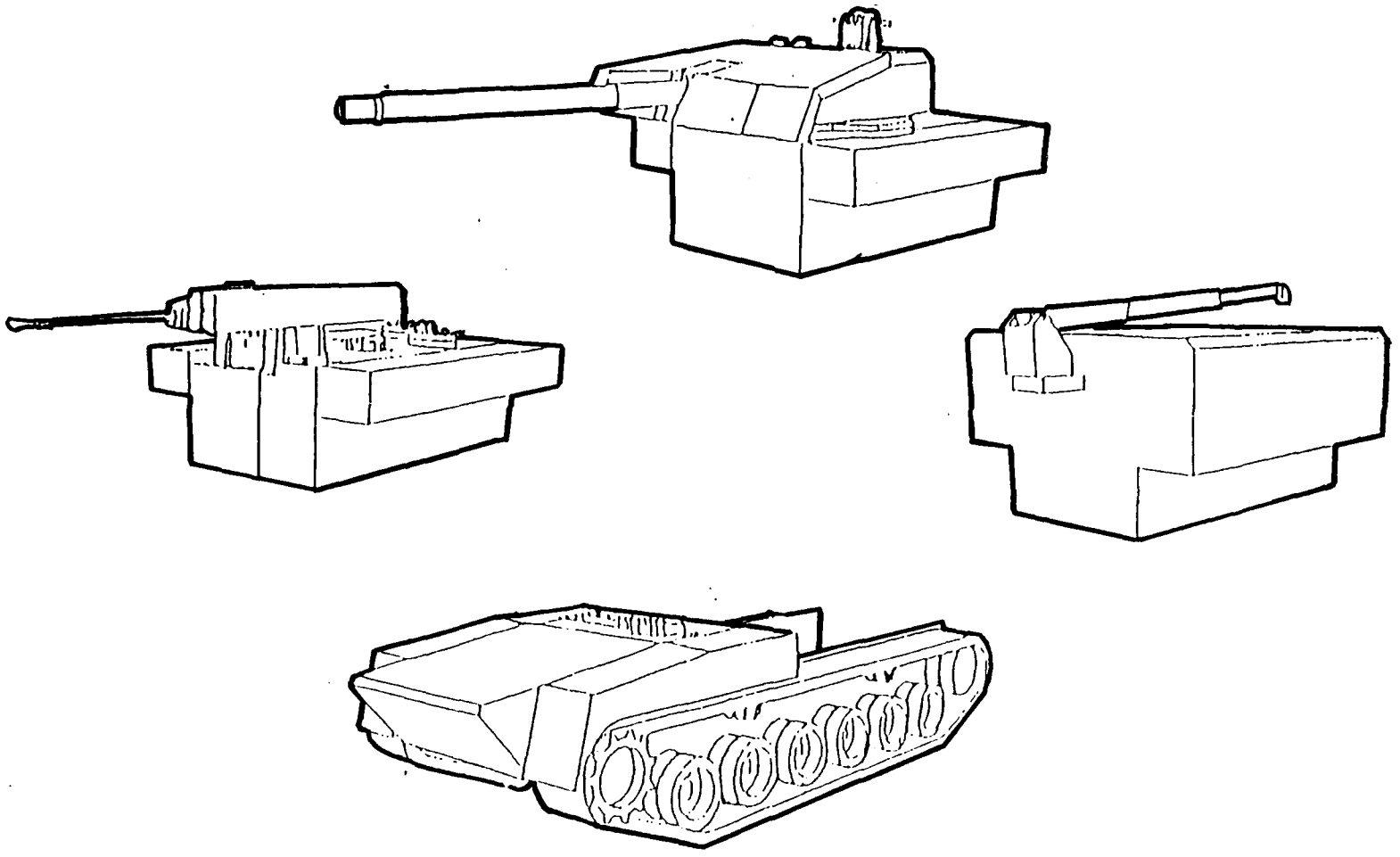
2. (U) System Description:

The Armored Family of Vehicles (AFV) is a system of armored fighting and support vehicles which will provide the Army its protected combat vehicle capability of the future. The family will consist of a minimum number of chassis which will accept different subsystem modules capable of fulfilling the required missions. Armor protection will be based on the specific mission. Potential armament systems for use in vehicle sub-systems include an improved direct fire weapon, 30-35mm cannon, 155mm improved howitzer, missiles, MLRS, DEW, Improved heavy MG and 7.62mm MG. It is anticipated that the AFV will have a Common data base architecture to support command, control, communictions and vehicle operations. The vehicle subsystems will enable the family to engage and destroy the anticipated threat, both the armored vehicle fleet and dismounted forces, by direct and indirect fire. Specific models will also allow the family to engage and destroy threat aerial capability, to include attack helicopters. The lighter weapons will provide all vehicles of the family with the capability to suppress and defeat light forces. The family will be supported with a comprehensive training package that will optimize the use of state of the art devices, particularly embedded systems. The training concept will align with the BDE/Div basis of issue format. The family system provides synergistic force performance improvements over the current combat vehicle system of separate and unrelated vehicle systems unique to their mission. Maximum efficiencies are achieved due to common technology in the areas of mobility, protection, firepower, combined arms team compatibility, survivability, night operations, reliability, availability, maintainability, MANPRINT and ILS. This family of vehicles, will be required to operate in all U.S. Army environments of potential employment. The common chassis, vehicle and Sub-systems currently envisioned for the Armored Family of Vehicles systems is indicated on the following chart.

THE EMERGING ARMORED FAMILY OF VEHICLES



ARMORED FAMILY OF VEHICLES SYSTEM



HEAVY CHASSIS & THREE CONCEPTUAL SUB-SYSTEMS

UNCLASSIFIED

3. Required Technical Characteristics:

Table 1 lists desired performance characteristics for the AFV as a total system, separate individual vehicle/sub-system characteristics will be established as the Best Technical Approach (BTA) evolves. Test and Evaluation requirements have not been defined. Performance characteristics for mission role variants will be formulated during Proof-of-Principle and included in future TEMPS for these variants.

4. Required Operational Characteristics:

Table 1 lists both the technical and operational characteristics which pertain to the AFV System. Individual vehicles will separately be required to meet the specific requirements of their O&O Plan and/or ROC. In addition, the AFV system must:

a. Be capable of sustained climatic operations defined in AR 70-38 and the O&O plans.

b. Provide cross-country mobility, command and control, protected firepower, and communication permitting rapid massing and dispersion of forces. Provide required combat protection, firepower, and control systems to acquire, engage, and defeat projected enemy force arrays in the timeframe specified (turn of the century) and at extended ranges under all combat environments in accordance with the O&O plans.

c. Possess ease of employment on the battlefield without excessive training/maintenance requirements.

d. Meet RAM-D Requirements, Logistics Burden Parameters: in an effort to provide indices to display the logistic burden impact, two additional parameters will be tracked during DT/OT. These parameters are termed Mean Miles Between Essential Maintenance Demand (MMBEMD) and Maintenance Man-hours Per Mile. These parameters provide an operational measure of maintenance burden as compared to current requirements which are hardware related.

5. Related AFV Test Management documents:

a. Computer Resource Management Plan (CRMP) for automation and communication resource development (and testing).

b. AFV ILSP/AS?

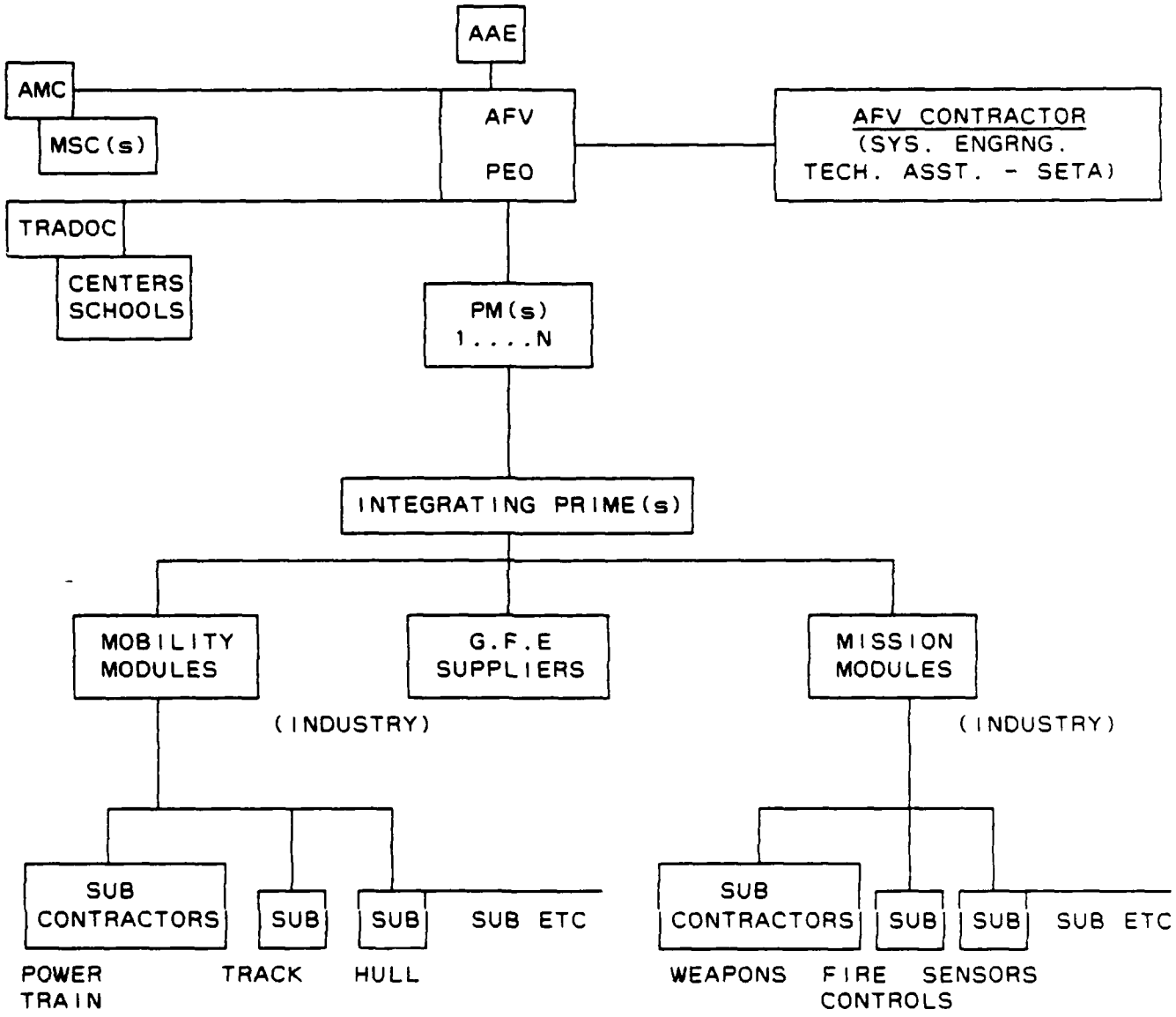
TABLE I

AFV TOTAL SYSTEM - KEY CHARACTERISTICS

Characteristic	Performance Required
The Armored Family of Vehicles must:	1. The family, consisting of approximately 30 sub-systems of variant modules, must collectively demonstrate:
defeat the turn of the century threat	a. Lethality to defeat the threat protection. b. Survivability, as provided by armor, mobility, or electronic means, to protect against the threat lethality. c. Acquisition, intelligence, Command, Control, Communications, and Computer C^4, RAM-D, & supportability necessary to engage the threat.
	2. Individual vehicle sub-systems with specific missions must demonstrate that they are capable of performing as required by their specific ROC.
Reduce system O&S Cost	The AFV collective system of modules must demonstrate lower overall system O&S costs compared to the alternative fleet of vehicles The alternative will consist of individual vehicles developed as required and/or product improved existing vehicles.

PART II-Program Summary

1. Management: The eventual overall management of the AFV is expected to be provided by a PEO, functioning under the Army Acquisition Executive as outlined below:



Test and evaluation (T&E) management will be provided by the Test Integration Working Group (TIWG). Meetings of the TIWG are convened at strategic periods throughout the Acquisition Cycle.

Specific agencies with management responsibility within the TIWG are AMSAA, OTEA, AFVTF, CAC, TECOM, TACOM, and TRADOC, (T&E director, and TSM), and LEA evaluation responsibilities will be handled by AMSAA and OTEA.

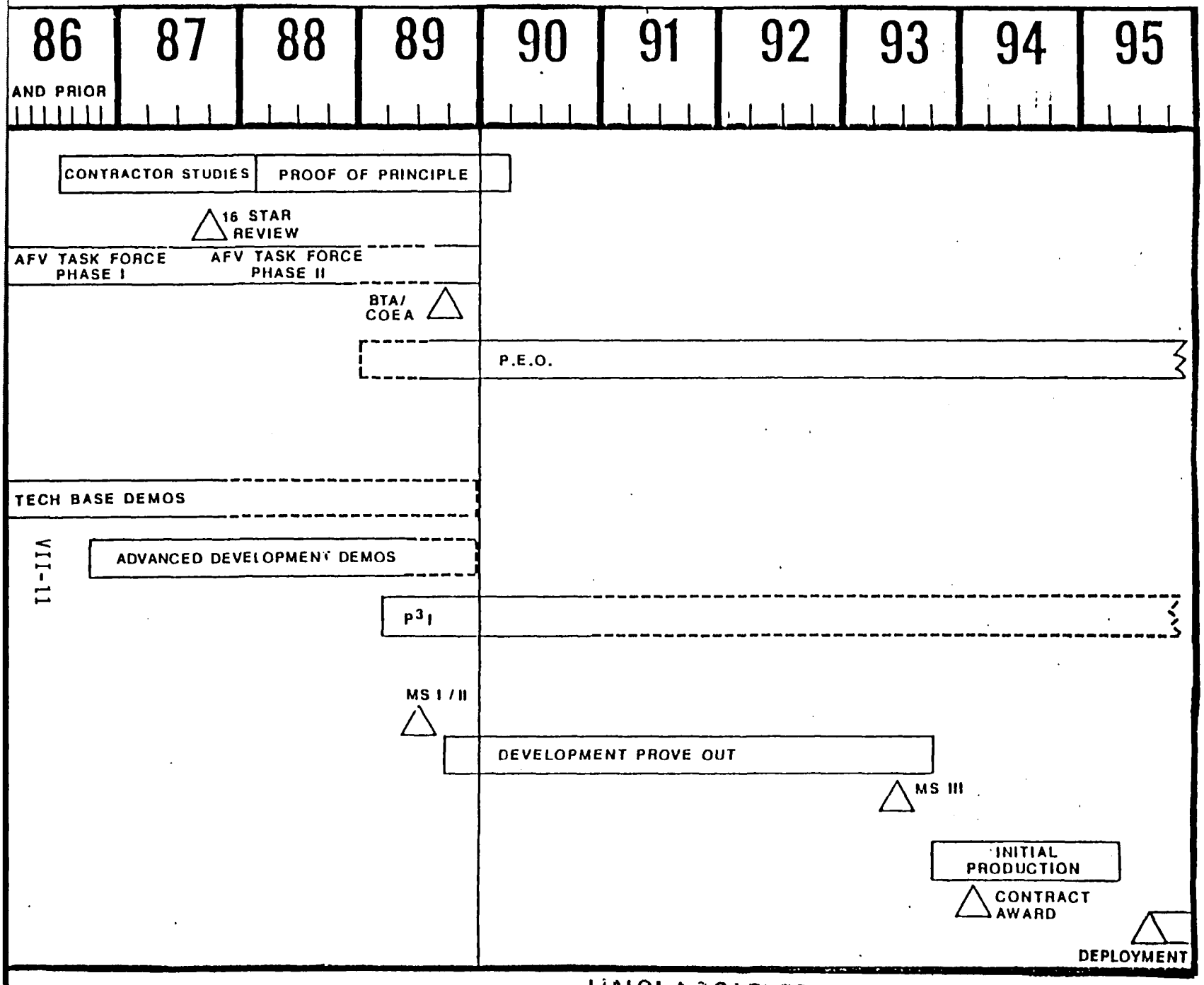
T&E will be structured as an integral part of the Acquisition Strategy (AS) to verify performance and assess the acquisition risks. In the case of the AFV. T&E will deviate from the norm in that the complete system of vehicles must be both individually tested to specific requirements and also collectively tested as a system for evaluation against the threat and O&S costs.

2. TEST CONCEPT

Initial experimentation and technical testing of components and technologies will be conducted in laboratories, factories and proving grounds and/or in field environments. Early user participation will be emphasized as a continuous factor in all testing.

This first TEMP provides general information on the strategy to be employed in conducting test and evaluation (T&E) during the proof-of-principle (POP) phase. It does not attempt to provide specific information on each test and evaluation effort. Since a large part of the envisioned test program consists of laboratory tests, the interface between LABCOM and the AFV Task Force, via the TIWG, will be critical in determining actual test requirements. Details regarding specific test and evaluation issues will be provided in succeeding TEMP updates (currently envisioned to be semiannually).

This TEMP outlines the T&E strategies for the umbrella program. TEMP information for individual or peculiar mission role variants will be prepared and included as addendums to the umbrella TEMP



Integrated Schedule.

Part III

DT&E Outline:

1. Critical Technical Characteristics:

Initial DT&E for the AFV will consist of maximum use of simulation, experimentation, testing and evaluation of emerging technologies, which are critical to the successful development of the family of vehicles. The various sub-systems and components will be required to demonstrate successful "Proof-of-Principle" in sufficient time to enter the Development-Prove Out (DPO) phase as a part of the "family", and/or be capable of being fully developed and ready for production at the time of milestone III.

a. Technological Attributes:

The pacing technologies critical to successful development of the armored family of vehicles include:

(1) Survivability sub-systems and components which include various types and degrees of protective armor, shielding from the effects of directed energy, and individual crew member protection devices.

(2) Lethality systems, components, and devices, sufficient to defeat the prescribed threat and adaptable to vehicle configurations.

(3) Mobility systems and components, including engines, transmission, final drive, & suspension, with maximum commonality, suitable to provide each vehicle in the family maneuverability as required.

(4) Command, control, communications, computers, vision equipment, intelligence & electronic systems to include target acquisition and fire control to meet the prescribed requirements with maximum commonality.

b. Component Characteristics

Test and evaluations will also be structured to provide data which address each of the following areas:

Reliability, Availability, and Maintainability (RAM)
System/Component Safety
Logistic Supportability
Software Test and Evaluation
Survivability (Conventional and Nuclear)
Chemical, Biological, and Radiological (CBR) Survivability
Training

Each of the aforementioned technical attributes and critical areas will be addressed by first determining the critical objective or need required of that attribute/characteristic, and then ensuring that planned testing provides the necessary data for the evaluation. Definitions of objectives and needs will be performed by the AFV Task Force and the TIWG using results from simulations, input from the LABCOM assessments of technological capabilities, and the AMC MAMP and MAIT process. This process of defining objectives and determining technological capabilities will allow the Army to reasonably define needs, technologies ability to satisfy them, and then the test and evaluation procedures needed to define capabilities.

2. DT&E to Date:

The DT&E accomplished to date on the AFV, consists solely of ongoing tests on the technologies required for the sub-systems. These consist primarily of laboratory model testing and experimentation.

3. Special Requirements for System/Subsystem Retest:

In those instances where critical technologies have been evaluated solely by simulation, testing of actual hardware will be emphasized early in the DPO phase of the program, depending mainly on the criticality of the item and scheduling requirements for development.

4. Future DT&E

AFV DT&E will consist of the POP phase leading to milestone 1/11 decision followed by a Development Prove out (DPO) phase. The DPO will include actual hardware testing of multiple vehicle samples designed to illustrate proof of production suitability by the Milestone III decision. Production phase test requirements will be determined based on results from the DPO phase.

a. Configuration Description:

The configuration of POP items will not be truly representative of production units but instead be breadboards/brassboards, mockups, test beds, simulation studies, and possibly some hardware systems. Those items fabricated during DPO will closely represent production items and be subjected to full end item testing. Current planning anticipates 80 to 100 subsystems to be fabricated by one competitively chosen contractor, or approx. 50 sub-systems manufactured by each of two different contractors. The second approach is intended to provide hardware competition through DPO.

b. DT&E Objectives:

The main objective of the initial two year phase of AFV testing will be to demonstrate to the decision makers that the technologies, major components, and critical devices are sufficiently proven through actual testing and evaluation or explicit simulations so as to permit satisfactory integration into vehicles and/or sub-systems with medium risk.

The objective needs that each critical technological attribute/component characteristic must satisfy will provide the basis for evaluating these capability demonstrations.

During the subsequent four years of Development Prove Out sufficient quantities of sub-systems will be required to both perform all necessary technical tests and provide sufficient hardware for the necessary force slice to be tested during IOT&E.

Subsequent testing will involve use of approximately 55 initial production vehicles to satisfy both First Article Tests (FAT) and Follow-On Operational Test and Evaluation.

Live fire testing will be performed on updated prototypes prior to production.

c. DT&E Events, Scope of Testing, and Basic Scenarios

A preliminary list of POP technology development demonstrations is detailed in the AFV Technology Assessment. This list will be further refined/pared down in subsequent TEMPs based on analyses of technical capabilities, how soon they can be available for demonstration and utilization, and how well they perform. During POP, RD&E Center and, LABCOM tech base programs identified, as likely programs. AFV development efforts will be reviewed by the TIWG to insure that objectives, criteria, and scope of testing are sufficient to allow a determination of suitability to enter the Development Prove Out (DPO) phase.

DPO events and scope will be formulated during the course of POP as successful technologies emerge for further development.

PART IV

OT&E OUTLINE

General Concept. Given the nature of this program, operational testing will not concentrate on testing each variant separately but view the system in a force slice context. The force slice testing concept involves investigating close combat (assault force), Assault Support Force and combat service support systems simultaneously to determine the effectiveness of the force as a whole. This concept is a radical departure from previous operational testing in that the entire combat system will be tested rather than the "eaches" that comprise the system. As each variant is developed it will be covered by an appendix to the master plan (TEMP) for the vehicle to address the peculiarities of the specific system. Each TEMP will be created to tie in with the family concept (master TEMP) to ensure the vehicle is not being tested in a vacuum but as an integral part of a fighting force.

1. Critical Operational Issues. The operational issues addressed in this paragraph apply to the entire family of vehicles and are general in nature. Specific operational issues for each variant will be provided in separate vehicle TEMP appendices as they are developed. The general family issues are:

a. Does the Armored Family of Vehicles (AFV) increase force effectiveness? This issue will be addressed in all phases of operational testing (EUT&E, IOT&E and FOT&E).

b. What factors must be considered prior to the tactical and strategic deployment of the AFV? This issue will be addressed in all phases of operational testing (EUT&E, IOT&E and FOT&E).

c. Is the AFV logistically supportable? This issue by its nature must be addressed in the final phase of operational testing as the logistic system must be adjusted to compensate for the commonality of components, modular replacements, new test equipment, etc. Logistic evaluations will be accomplished during, IOT&E, FOT&E and throughout the continuous comprehensive evaluation program.

d. Is the AFV engineered to optimize the man-machine interface in terms of: manpower, training, system safety, human engineering and health hazards (MANPRINT)? This issue will be addressed in all phases of operational testing.

e. What are the Reliability, Availability and Maintainability (RAM) characteristics of the AFV? This issue is primarily addressed in developmental testing. Availability and maintainability data will be collected and analyzed during EUT&E, IOT&E and FOT&E.

2. OT&E TO DATE. No operational testing has been completed to date as this program is currently in its conceptual stage.

3. FUTURE OT&E. All phases of early operational testing are planned to support the FY89, MSI/II decision.

a. Early User Test and Evaluation (EUT&E) is currently planned for FY89 involving user personnel during the proof of principal and technical demonstration phase. The purpose of this test is to identify and resolve MANPRINT, technical and performance issues early in the development cycle.

(1) Configuration Description: TBD

(2) EUT&E Objectives: To identify and resolve MANPRINT, technical and performance issues early in the development cycle.

(3) EUT&E Events, Scope of Testing, and Scenarios: TBD including development and use of MANPRINT test beds.

(4) Test Limitations. The use of simulation technologies, mock-ups, brassboards and test beds, in place of full prototypes during POP will create significant integration risks for Development Prove Out and IOT&E.

b. Initial Operational Test and Evaluation is currently planned for FY93 involving user personnel employing selected variants of the AFV force slice under operational conditions. The IOT&E will be conducted with preproduction/prototype items prior to the MSIII decision. The intent of the IOT&E is to provide a valid estimate of expected system operational effectiveness and suitability.

(1) Configuration Description: All vehicles tested during this phase will be in preproduction or prototype configuration.

(2) IOT&E Objectives: To provide a valid estimate of expected system (force) operational effectiveness, suitability and survivability.

(3) IOT&E Events, Scope of Testing, and Scenarios: The general concept involves employing the smallest tactical elements (e.g. tank platoon, merchandized infantry platoon, field artillery section etc.) and support vehicles in an operational effectiveness and suitability. The threat will be simulated by deploying surrogate vehicles using prescribed threat tactics.

(4) Test Limitations: None known at this time.

c. Follow-on Operational TEST and Evaluation. Is currently scheduled for FY95 to obtain information on: post-production decision vehicles, support systems, logistic supportability issues and to verify correction of materiel, training or concept deficiencies.

(1) Configuration Description. Given the magnitude of the armored family of vehicles program, e.g. 33 sub-systems, it is expected a mixture of production and prototype vehicles will be available for testing.

(2) FOT&E Objectives: To obtain information on production/prototype vehicles, support systems, logistic supportability, verify corrections of materiel, training and concept deficiencies, and conduct full vehicle survivability testing:

(3) FOT&E Events, Scope of Testing, and Scenarios: The general test concept involves deploying a battalion task force combat unit with appropriate supporting elements under simulated combat conditions. The test scenarios will include those missions stipulated by the Army Training and Evaluation Program's (ARTEP'S) for the respective combat, combat support and combat service support units. The threat will be simulated by surrogate vehicles employing current threat tactics.

(4) Test Limitations: None known at this time.

Part V

Test and Evaluation Resource Summary

Determination of both government and contractor resources necessary for sufficient developmental testing leading to the appropriate acquisition decision will by necessity be established during the POP phase of the program. As technologies evolve and are proven for inclusion in the developing "family", the resource requirments will be defined in detail so as to permit successful accomplishment of the necessary test-analyze-fix-test process in the allotted time. Those areas requiring resolution include:

1. Test Articles:

During Proof of Principle the items to be tested and evaluated will consist primarily of breadboard/brassboard hardware of emerging technologies, as well as engineering mockups of specific sub-systems for MANPRINT evaluations and for use with physical simulators. A detailed listing of test article requirements will be included in the various appendices to the TEMP as they mature.

The Development Prove Out phase will result in one selected contractor fabricating 80 to 100 prototypes, or two competitive contractors building approximately 50 prototype sub-systems each to be used for both technical testing and user evaluation, followed by live fire testing as appropriate.

The initial production vehicles, which will be produced at a limited rate, are intended to be used for initial production tests and follow-on operational tests.

2. Test Sites & Instrumentation:

The instrumentation and sites to be used during Proof of Principle will primarily be located at contractor facilities, major subordinate commands (TACOM, AMCCOM, etc) and TECOM proving grounds within the continental United States (APG, YPG, etc). Facilities at Ft. Knox (SIMNET) and Ft. Hood will also be utilized.

During the Development Prove Out phase, US Army testing facilities may be taxed to the maximum, due to the large number of vehicles (80 to 100) many of which will require testing simultaneously, to permit evaluation of interrelated capabilities. It is contemplated that facilities such as Ft. Hood or possibly Gowen Field may be used for joint operations and "Brigade Slice" evaluation.

3. Test Support Equipment To be determined.

4. Threat Systems: Extensive physical simulation of projected threats will be required to evaluate the AFV ability to counter them. New sites and facilities may be necessary for certain directed energy evaluations.

5. Test Targets: Specific targets will need to be determined during the Proof of Principle phase of testing, in order to allow sufficient time to fabricate required quantities for developmental tests.

6. Operational Force Test Support Identification of the specific transportation requirements and other support items will be determined as actual end item test parameters evolve.

7. Simulators, Models, and Testbeds: As previously discussed numerous simulators, models and test beds will be used to evaluate sub-system testbeds, especially during Proof of Principle.

Use of the supercomputer at TACOM is planned, to conduct vehicle system performance trade-offs prior to actual hardware fabrication. In addition, it will be invaluable for dynamic simulation, design sensitivity analysis and optimization, software integration and graphics for communication and control.

Physical simulators will be used by contractors and the government for Proof of Principle testing of crew station display and control devices, man/machine interface issues, weapon station stabilization and control and embedded training. The SIMNET-D technology at Ft. Knox will have significant application to AFV testing, and user evaluations. Such things as evaluation of operational effectiveness trade-offs of sighting equipment, vehicle speeds, embedded training and maintenance devices will be addressed. Evaluation of new sizes and increased rates of fire effects will be accomplished.

8. Special Requirements A significant special requirement envisioned for testing the AFV is the extent of resources which will be necessary to perform the many required technical and operational tests in a timely manner. Manpower, support equipment, facilities, and funding will have to be made available in unprecedented quantities. However, the fact that proceeding with the AFV program will eliminate the need for the current type of testing of multiple varieties of "eaches", and instead allow concentration on the requirement of the "family", should offset preconceived negative opinions.

9. T&E Funding Requirements: Due to the present number of unknowns which directly affect the costs to test the AFV, i.e: quantities and variation of sub-systems, determination of the specific technologies to be included and finalization of schedule parameters; funding requirements for T&E will be determined as the Best Technical Approach evolves following the AFVTF review in Aug '87.

10. Resource Schedule: The scheduling of test resources will be developed in conjunction with the determination of funding requirements.

11. Manpower/Training: As discussed under special requirements, significant manpower resources will be required for both Technical Testing and User Testing and in a timely manner to meet FORSCOM 540 R dates. In addition, special training in the operation of new technical equipment will undoubtedly be necessary, as well as the determination of the need for embedded training and special training devices.

Appendices: AFV Technology Requirements. (Separated)

ARMORED FAMILY OF VEHICLES

TASK FORCE

PHASE I REPORT

VOLUME VIII

RATIONALIZATION, STANDARDIZATION, AND INTEROPERABILITY PLAN

31 AUGUST 1987

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(This Page Is Unclassified)

APPENDICES

FIGURES

(U) RATIONALIZATION, STANDARDIZATION AND INTEROPERABILITY PLAN FOR THE ARMORED FAMILY OF VEHICLES

(This Section Is Unclassified)

1. INTRODUCTION

a. PURPOSE. This Rationalization, Standardization and Interoperability Plan (RSIP) is prepared to ensure full consideration of RSI requirements and opportunities during development and acquisition of the Armored Family of Vehicles (AFV) by all agencies involved in the project.

b. BACKGROUND. The charter for the Armored Family of Vehicles Task Force was approved by the Chief of Staff, Army on 6 October 1985. The Task Force became fully operational in June 1986 at Fort Eustis, Virginia, reporting to Deputy chief of Staff for Operations, HQDA. Major objectives and guidance included responsibility to develop and field a force capable of defeating the projected threat, significantly reduce system and force O and S costs and exploit to the maximum feasible the potential advantages of commonality and modularity. The justification for a Major System New Start (JMSNS) was approved 6 August 1986. The first major milestone was the decision by the Requirements Review Committee, chaired by the Army Chief of Staff, on 19 August 1987 to continue the AFV Task Force effort into Phase II, Concept Exploration and Definition.

c. POLICY. RSI will be considered for the AFV in compliance with goals established with North Atlantic Treaty Organization (NATO) and American, British, Canadian and Australian (ABCA) members for standardization and interoperability of equipment. Cooperation with other countries will be pursued as appropriate. The provisions of AR 34-1, "United States Army Participation in International Military Rationalization/Standardization/Interoperability"; AR 70-1, "Research, Development and Acquisition Systems, Acquisition Policy and Procedures"; AR 71-9, "Force Development Materiel Requirements"; DODD 2010.6, "Standardization and Interoperability of Weapons Systems and Equipment within the North Atlantic Treaty Organization"; and Public Law 99-145, "Cooperative Opportunities Document" apply to RSI consideration for the AFV. Other U.S., NATO and ABCA references pertaining are listed in Appendix B, References.

2. SYSTEM DESCRIPTION

a. GENERAL. The AFV will be designed to overcome the majority of battlefield deficiencies of the current fleet and defeat the threat across the full spectrum of armored conflict in multiple geographic regions through the early part of the Twenty First Century. An integral design principle is allowance for Pre-Planned Product Improvement (P^3I) to accommodate future technologies a they emerge throughout the life of the system and assure continued battlefield effectiveness. AFV will

incorporate the results of numerous on-going programs as components or subsystems of the AFV basic designs, will replace the majority of existing armored systems and introduce some new systems and capabilities.

b. AFV MISSION ROLES. Figure I depicts the missions to be performed by the AFV and Figure II the concept for incorporating them into the AFV. Figure III describes the transition to the AFV from the existing armored fleet. It is readily apparent from Figure I that AFV encompasses a majority of future Army systems and capabilities. These mission roles were derived from the Operational and Organizational Plan for the AFV dated 8 June 1987.

FACS-FUTURE ARMORED COMBAT SYSTEM (TANK)
BRIDGE - COMBAT GAP CROSSER (CGC)
IFV-INFANTRY FIGHTING VEHICLE
SAPPER-SAPPER VEHICLE
RECON-FUTURE RECONNAISSANCE VEHICLE (FRV)
DE-DIRECTED ENERGY WEAPONS VEHICLE (DEW-V)
FIST SUPPORT AND COMBAT OBS LASING SYSTEM (FSCOLS)
AMBUL-ARMORED AMBULANCE (AA)
CMV-COMBAT MOBILITY VEHICLE
LOS-AT-KINETIC ENERGY MISSILE (KEM-V)
LOS-AD-LINE-OF-SIGHT FORWARD HEAVY (LOS-F-H)
RECOV-RECOVERY VEHICLE (RV)
HOWITZER-ADVANCED FIELD ARTILLERY SYSTEM-CANNON (AFAS-C)
R^3 FUTURE ARMORED RESUPPLY VEHICLE (FARV) (REARM, RESUPPLY, REFUEL)
MAINT-MAINTENANCE ASSISTANCE AND REPAIR SYSTEM (MARS)
GPC-GENERAL PURPOSE CARRIER
NBCRS-NBC RECONNAISSANCE SYSTEM
MORTAR-MORTAR WEAPON SYSTEM
SMOKE-COMBAT SUPPORT SMOKE VEHICLE (CSSV)
MDV-MINE DISPENSING VEHICLE
NLOS-NON--LINE-OF-SIGHT-ANTI-TANK/AIR DEFENSE (NLOS-AT/AD)
IEW-INTELLIGENCE & ELECTRONIC WARFARE VEHICLE
FC^2V-FUTURE COMMAND AND CONTROL VEHICLE
TGT ACQ-ELEVATED TARGET ACQUISITION SYSTEM (ETAS)
RCKT/MSL-ROCKET AND MISSILE SYSTEM (RAMS)
ASV-ARMORED SECURITY VEHICLE
CEM-COMBAT EARTHMOVER
LFACS-LIGHT FACS
CEX-COMBAT EXCAVATOR
BNAID-MEDICAL AID STATION VEHICLE

FIGURE I

c. EMERGING AFV. Figure II displays a concept for an Armored Family of Vehicles which incorporates the 30 roles into eleven models mounted on two chassis, a heavy and a medium. The emerging family is based on a concept of an Assault Force and an Assault Support Force. The Assault Force must perform its mission within direct fire range and is therefore mounted on the heavy chassis. The Assault Support Force will normally perform its mission out of direct fire range and with the exception of the FV-5 Howitzer, these subsystems are mounted on a medium chassis. The Howitzer requires a heavy chassis both to

meet the projected threat and to carry a much larger caliber howitzer. There are currently some variances between the emerging AFV and missions stated in O&O Plans which continue to be addressed. Further interaction between combat developers and the Task Force during Phase II will probably result in other changes.

THE EMERGING ARMORED FAMILY OF VEHICLES

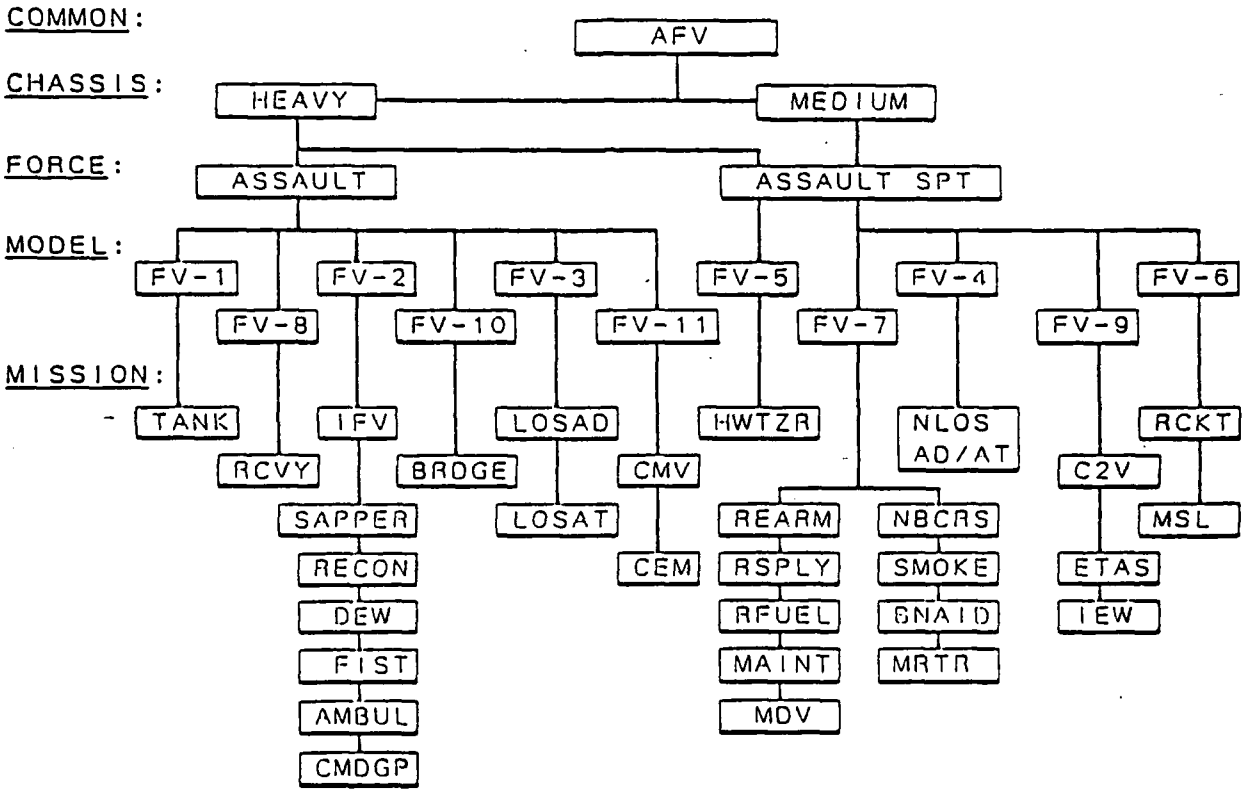

Figure 11

d. TRANSITION. Figure III shows the transition from the current armored fleet into AFV and relative positioning on the battlefield.

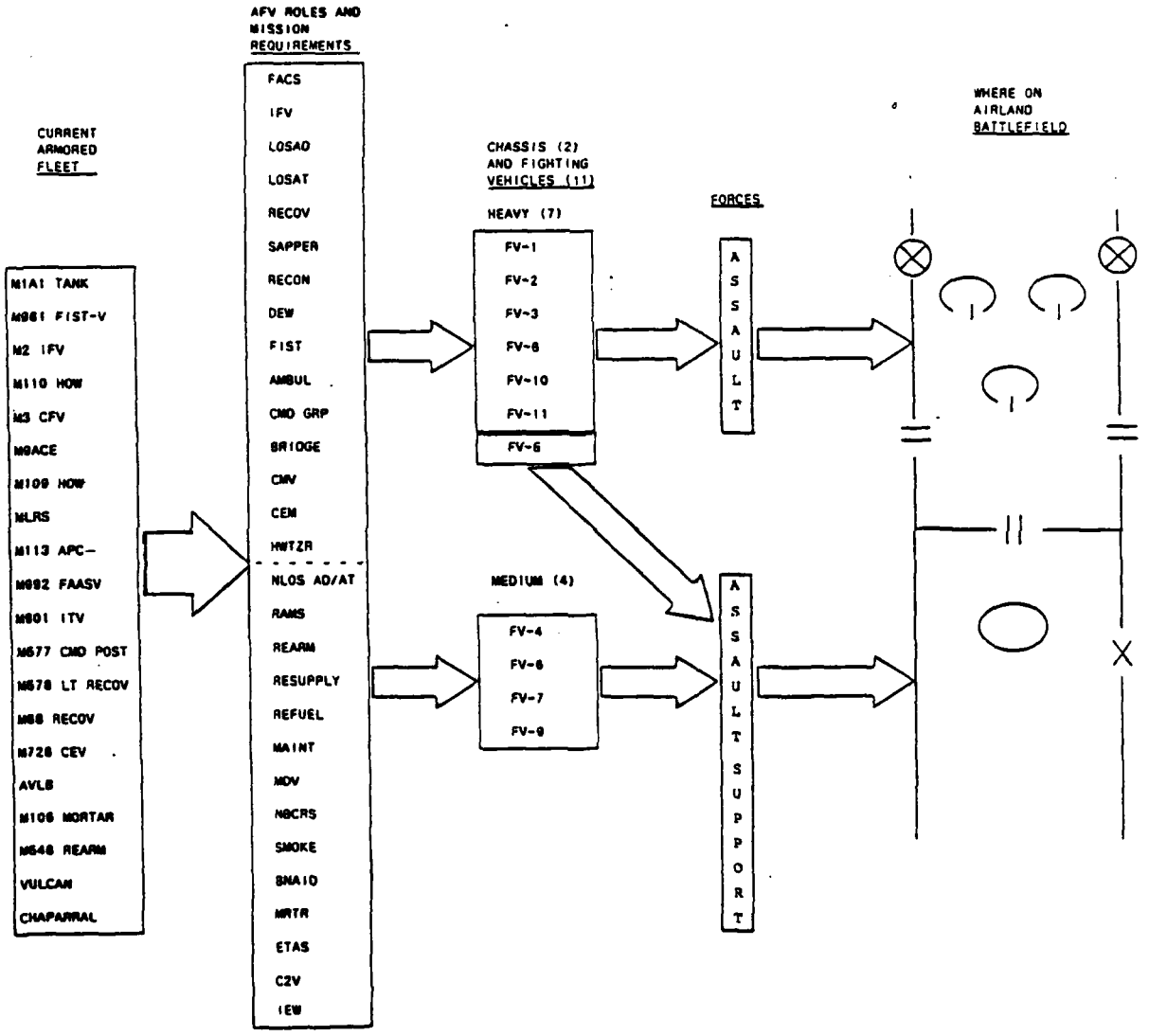

Figure III

e. DEFICIENCIES ADDRESSED. The AFV system will correct many of the deficiencies shown in Battlefield Development Plan (BDP) 86. Following are the major deficiencies extracted from the Long Range Research, Development and Acquisition Plan FY88-02, dated February 1986.

1) Close Combat - BDP-86 Deficiencies #1, 11, 12, 46, 47, 65.

2) Fire Support - BDP-86 Deficiencies #17, 26, 48, 54.

3) Air Defense - BDP-86 Deficiency #8.

4) Combat Support - BDP-86 Deficiencies #29, 35, 38, 41.

5) Combat Service Support - BDP-86 Deficiencies #9, 13, 14, 20, 22.

6) Information Management - BDP-86 Deficiencies #4, 36.

7) Training - BDP-86 Deficiency #91.

f. MILESTONES. Major Milestones for the AFV are shown below. It should be noted that technology, combat and systems development currently on-going throughout the Army and in other services or agencies directly support development of the AFV and must therefore be considered in determining cooperative opportunities. Subsequent paragraphs outline a methodology for doing so. Major program milestones in Phase II are:

Requirements Review Committee (RRC) Decision	19 Aug 87
Best Technical Approach (BTA) Selection	Sep 88
Milestone Decision Review (MDR) I (II), Enter Full Scale Development (FSD) (Note: all subsequent milestones assume MDR II decision)	4QFY89
MDR III Production Decision	4QFY93
Low Rate Initial Production (LRIP) Decision	1QFY94
Full Rate Production Decision	1QFY95
First Unit Equipped	4QFY95

3. RSI APPROACH

a. PHASE I EFFORT.

1) It is intended that the AFV program consider NATO and ABCA doctrine, standardization and interoperability objectives in combat, training and materiel development, procurement, and product improvement activities. Prime contractors will be encouraged to solicit foreign participation to gain economic and technology benefits commensurate with approved technology transfer. Appropriate Army agencies, under DOD cognizance as established in the National Disclosure Policy, will determine sensitivity of information and approve technology transfer prior to release.

2) Consistent with regulatory requirements and with initial guidance and in recognition of potential advantages to be gained through shared international efforts, the AFV Task Force has actively pursued development of RSI opportunities. Efforts to date have focused on informing allied governments and industries of AFV concepts and directions and on soliciting ideas and concepts of potential value to AFV. These interchanges have fostered industry-to-industry relationships and have assisted in defining the network of existing and required agreements, activities and organizations involved. The Task Force has taken an initial step in identifying this potential by visiting the major European Ministries of Defense and firms engaged in production of military hardware for NATO. Although Germany, United Kingdom, Canada and France received primary focus due to capability, existing agreements and significant commonality of interests, potential contributions of other friendly nations will not be ignored. Countries such as Sweden, Japan, Israel, Brazil and Korea have technology experience or production bases which offer significant opportunities. To date, Sweden and Brazil have been visited and Israel has been briefed. Others will be addressed as resources permit. The results of visits and briefings are summarized in Appendix C.

b. PHASE II REQUIREMENTS.

1) The AFV Task Force will seek RSI opportunities at the component, functional and interface levels to the maximum extent possible. Maximum coordination will be sought with those commands currently engaged in RSI initiatives, primarily AMC and TRADOC, in order to take advantage of existing efforts and experience. It is not envisioned that the AFVTF will initiate or resource a separate RSI capability although participation in cooperative efforts with other nations will take place as appropriate. This approach however, places a premium on the integration of AFV requirements into on-going efforts to the extent possible. The concept for accomplishing this is through formation of an RSI Working Group (RSIWG) consisting of representatives from key organizations engaged in international operations.

2) International offices, such as Research, Development and Standardization Groups; Army Research Office; TRADOC Liaison Offices; Office for Defense Cooperation; Defense Attache Offices; etc., also provide excellent conduits for obtaining information on allied capabilities and cooperative opportunities and for providing information on the AFV. To the extent possible consistent with their resources and mission requirements, these organizations must be included in the network of agencies accessible to the RSIWG. Briefing allied governmental and industrial representatives; attending conferences, seminars, demonstrations and meetings; or obtaining particular information are examples of assistance which might be requested and which in general is in line with the mission of these organizations. Of immediate importance is providing adequate information so that requirements and opportunities associated with AFV will be recognized and the information provided to the RSIWG.

3) RSIWG Functions and Organization.

a) General. In order to identify and access international opportunities, AFV requirements must be related to interoperability priorities and placed into a hierarchy that describes the degree to which standardization will be required. Assuming compatible operational requirements, materiel interoperability must be considered in terms of internal and external functional interfaces and common components or systems, ranging across the spectrum from expendables (fuel and ammo), interchangeable or common components (engines, gun tubes, fire controls) to common systems. External interfaces include communications, battlefield management, rearming/refueling, etc.

b) RSIWG Functions. The Working Group (Standing Membership) functions as a management team to identify and initiate action required to provide RSI support for AFV development and production. Specific tasking will be issued through appropriate channels for accomplishment and results will be integrated into a comprehensive plan by the Working Group. The following statements broadly define required actions:

o Analyze AFV concepts, designs and supporting technologies by system, component, function and interface requirement and recommend consideration for RSI as appropriate.

o Analyze U.S. programs and their on-going RSI efforts for integration/adoption in the AFV program.

o Identify and evaluate developmental programs, technological and industrial capabilities of allied and friendly nations to identify potential candidates for cooperative effort in support of the AFV program.

o Define and prioritize technological, industrial, functional component and system areas which are required/likely candidates for cooperative arrangements.

o Examine the potential of existing programs, exchange agreements, memoranda, etc., to support the AFV program.

o Establish requirements and timelines for areas deemed suitable for cooperative efforts which are not supported by existing agreements.

o Designate agencies to negotiate agreement with allies to conduct cooperative development or otherwise integrate opportunities into the AFV program.

c) RSIWG Membership. Standing memberships on the working Group will consist of representatives from Department of the Army, AFV Task Force, Army Materiel Command, Training and Doctrine Command and from subordinate commands and agencies as determined by DA, AMC and TRADOC. Initial membership is listed at Appendix A. Other representation will be required on occasion to address particular RSI requirements or issues. Requests for such temporary representation will be made through appropriate headquarters. The AFV Task Force will chair the RSIWG through Phase II of AFV Concept Exploration and Development.

4) RSI Opportunities. The identification of RSI opportunities and their implementation as part of the AFV program requires an RSI decision methodology and a "best" approach to implementation of RSI. Figure 4 outlines a decision process leading to a determination of the best approach for integrating RSI considerations into AFV development. The chart at Figure 5 illustrates further the decision process required.

AFV RSI DECISION METHODOLOGY

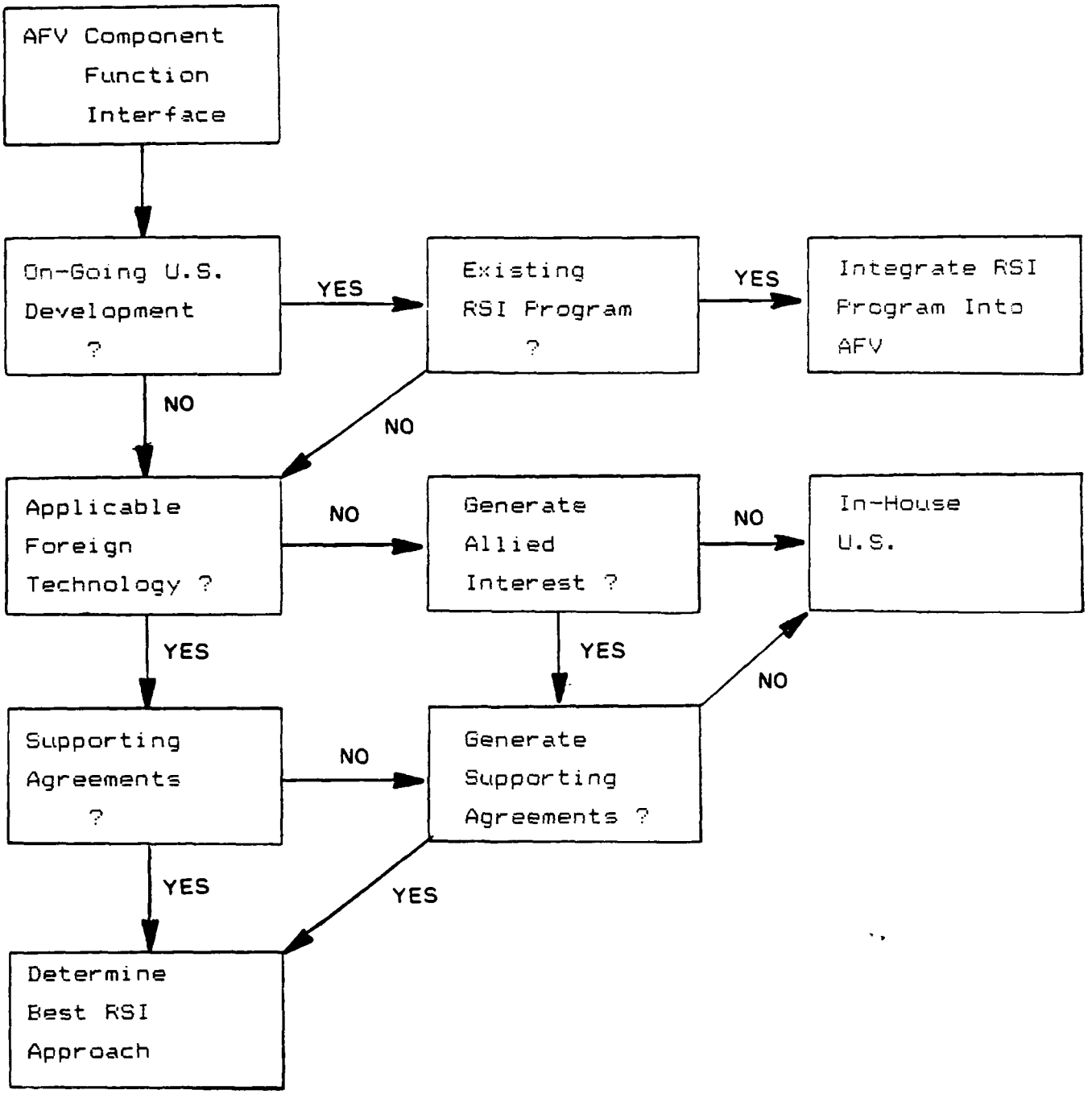

Figure IV

APPROACH DETERMINATION
(Example)

AFV COMPONENT, FUNCTION OR INTERFACE	CO-DEVELOP	CO-DESIGN	CO-PRODUCE	OVERSEAS PROCUREMENT	LICENSED PRODUCTION
GUN					
TRACK					
SUSPENSION					
COMMO					
BMS					
IEW -					
REARM					
REFUEL					
REPAIR					

Figure V

VIII-12

(U) APPENDIX A

RSI WORKING GROUP
(This Appendix Is Unclassified)

A. Standing Membership:

AFV Task Force (Chairman)
ATTN: DAMO-AFV-T
Ft. Eustis, VA 23604-5597
LTC Joseph W. Gibson
AV 927-1463; Com (804) 878-1463

HQ DA ODCSOPS
ATTN: DAMO-FDN
Washington D.C. 20310-0460
Mr. John Elliott
AV 227-5913
LTC Robert Potts (Alt)
AV 227-5093

HQ AMC
ATTN: AMCICP-RD
5001 Eisenhower Ave.
Alexandria, VA 22333
Mr. Michael Zapf
AV 284-9721

HQ AMC
ATTN: AMCICP-SS
5001 Eisenhower Ave.
Alexandria, VA 22333
Mr. Glen Norfolk
AV 284-3219
Mr. Edward J. Lewandowski
AV 284-9728/9

HQ USA TACOM
ATTN: AMSTA-CK
Van Dyke Ave.
Warren, MI 48397-5000
Mr. William E. Lowe
AV 786-8585; Com (313) 574-8587

PEO Combat Vehicles
ATTN: AMCPEO-CCV-I
Van Dyke Ave.
Warren, MI 48397-5000
Mr. Ron Shankland
AV 786-6821; Com (313) 574-6821
Mr. William Von Zastrow (Alt)
AV 786-6811

HQ TRADOC
ATTN: ATCD-MH/ATCD-Y
Ft. Monroe, VA
Mr. William Jones
AV 680-2306
Mr. Michael Kaspareck
AV 680-4409

HQ USA MICOM (USAMIC Redstone Arsenal)
ATTN: AMSMI-SA-FC/AMCPM-AT-P
Huntsville, AL 35898-5650
Mr. Jerry Sumners (Interim)
AV 746-5111
Dr. Katy Turner (Alt)
AV 746-8810

*HQ DA SARD
ATTN: SARD-IN
Washington D.C. 20310
AV 227-4310

*Office of the Secretary of Defense
ATTN: USDA-IPT
Washington D.C. 20310
AV 224-3203

*Representation as required.

B. Points of Contact:

(To Be Developed)

(U) APPENDIX B

RSI REFERENCES

(This Appendix Is Unclassified)

AR 70-1

AR 71-9 Draft (27 March 1986)

AR 34-1

AR 34-2

DA PAM 70- Draft (16 June 1987)

DAMO-ZA Memorandum Subject: Armored Family of Vehicles Task Force (AFVTF)

DODD 2010.6 (5 March 1980)

DODD 2040.2

DODI 5000.1

DODI 5000.2

NATO Standardization Agreements and Allied Publications AAP-4 (1987)

PUBLIC LAW 99-145 Cooperative Opportunities Document

NATO Cooperative Opportunities Document

(U) APPENDIX C

AFV ROLE IN INTERNATIONAL RSI
(This Appendix Is Unclassified)

1. The AFVTF works through the established framework of international agreements and working groups to define areas of potential cooperation with allied nations. These efforts are normally limited to working with existing international efforts to identify technologies and examine on-going programs of AFV interest, providing information to support discussion of AFV emerging concepts and requirements with allies, to assure AFV compliance with agreements and define opportunities for cooperation which can be accommodated in the concept and design of the Armored Family of Vehicles. It is not anticipated that the AFVTF will assume a direct role with non-US governmental agencies or firms to define or negotiate cooperative possibilities and agreements. Such activities must be accomplished by the appropriate major command with responsibility for the particular area being considered. An RSI Working Group will define and recommend those opportunities and areas in which agreements should be negotiated.

2. Contact has been established with the major agencies involved in the conduct of international operations; DA, TRADOC and AMC. These agencies as well as a number of their subordinate working groups have been briefed on the AFV, are kept abreast of evolving requirements and provide information to the Task Force on their efforts. The Task Force recognizes the responsibility assigned to those agencies as well as the expertise and resources required to accomplish the international mission. These range from establishment of common threat definition and operational techniques through exploration of specific cooperative programs.

3. As the concept for the armored family is finalized, critical technologies, specific programs, production capabilities and unique concepts with potential for application to the AFV or allied efforts must be identified and cataloged in time to accommodate the decision process and establish necessary agreements. Further, it may prove advantageous to identify and encourage the forging of non-governmental commercial/industrial links which will foster exchange of technology, developmental programs and production capacity within constraints imposed by security or national interest. The following outlines the concept for future AFV focus:

a. Continue to create an environment fostering industry to industry cooperation

b. Leverage existing possibilities to AFV advantage

c. Guide on-going international efforts

d. Work with DA and DOD to focus and consolidate international requirements

e. Identify the need for agreements supporting information exchange

4. Consideration must be given to mandated requirements for standardization or interoperability as expressed in law, regulation or consummated and planned agreements as the development and production of the Armored Family of Vehicles is defined. The knowledge and expertise necessary to identify such requirements resides primarily in those agencies charged with the international operations missions. The ability of allied nations to mutually support each other's forces on any future battlefield is a critical consideration in design of combat vehicles and subsystems. Availability of mutual support capabilities can substantially increase the combat effectiveness of all forces, while simultaneously reducing logistics and maintenance support requirements. This capability is particularly important in regard to expendables (munitions, POL, etc.), but could be even more effective if repair parts or even major components (weapons, power packs, sensor systems) could be made interchangeable. In addition, significant economies can be achieved if costs for research, development, or production can be shared.

5. In addition to establishing lines of communication with those US agencies having primary responsibility for international operations, the AFV Task Force has briefed and participated in discussions with key United Kingdom, Canadian, French, German and Swedish Ministry of Defense personnel responsible for both concepts and materiel development. By extension, the commercial/industrial capabilities of firms in allied nations are also key in establishing cooperative efforts and some have been included in visits. These have taken place in the US and in the countries involved, addressed on-going studies those countries have undertaken regarding future armored systems requirements and concepts, as well as technological and industrial capabilities. Highlight of visits are outlined below:

UNITED KINGDOM

INDUSTRIES	ALVIS	ROYAL ORDNANCE
	VICKERS	GKN DEFENSE
TECHNOLOGIES	Armor	Breech Loaded Mortar
	Lasers	Hydropneumatic Suspension
	Crew-In-Hull	Robotics
	In-Bore Fuze Setting	Guns and Ammo
	Recovery & Engineer Vehicles	
GOVERNMENT CONTACTS	MG Stibbon	Assistant Chief (Land), Defense Staff for Operational Requirements
	MG Stopford	Director General Fighting Vehicles and Engineer Equipment
	Mr. Evans	Director, Armaments Research and Development Element

CANADA

INDUSTRIES	COMPUTING DEVICES CORP	GM OF CANADA
	HUGH KEN TRANSMISSIONS	GARRETT
	HARRISON AERONAUTICAL	CHT STEEL
	CANADIAN MARCONI	BOMBARDIER
TECHNOLOGIES	Armor	Fire Control
	Hi-Hard Steel	Heavy Industry
GOVERNMENT CONTACTS	BG Spencer	Director, Land Doctrine and Operations, National Defense Headquarters
	Mr. Blake	Director General, External Affairs, Defense Programs Bureau

GERMANY

INDUSTRIES	MAK KRUPP	THYSEN HENSCHEL
	WEGMANN	KRAUSS MAFFEI
	MTU	RHEINMETALL
TECHNOLOGIES	Armor	Optronics
	Fire Control	C2
	Robotics	Elect. Propulsion/Turret Drive
	Diesel Engine	Heavy Wheeled Chassis
	Recovery Vehicle	Front Drive Tracked Chassis
GOVERNMENT CONTACTS	MG Behrendts	Chief, Army General Staff
	BG Bernhardt	Director, Planning, Army General Staff
	BG Schmidt-Petri	Director, Armaments, Army General Staff
	Mr. Bosse	Director, Defense Material Land, Armaments Office
	Dr. Becker	Director, Defense Research Facility

FRANCE

INDUSTRIES	GIAT	CSEE
	SAGEM	ESD
	SAT	
TECHNOLOGIES	Optronics	Fire Control
	C2	Dynamic Muzzle Reference System
	Position Location	Electric Turret Drive
	Hyperbar Engine	
GOVERNMENT CONTACT	BG Michulam	Chief, Mobility, Armaments Office

SWEDEN

INDUSTRIES	HAEGGLUND BOFORS	SAAB
TECHNOLOGIES	Armor Integrated Electronics Missiles Training	Signature Track and Suspension Munitions MANPRINT
GOVERNMENT CONTACTS	LTG Bengtsson	Commander in Chief, Army
	MG Gard	Commander, Army Materiel Department (FMV)
	BG Persson	Chief, Mobility Directorate, FMV
	Mr. Sven Berge	Designer, S-Tank

BRAZIL

INDUSTRIES	ENGESA MOTO PECAS	EMBRAER
TECHNOLOGIES	Systems Integration Low Cost/Low Rate Production	Computer Aided Design
GOVERNMENT CONTACTS	None	