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# THESIS

**A COMPARATIVE ANALYSIS OF THE ACQUISITION STRATEGIES OF ARMY TACTICAL MISSILE SYSTEM (ATACMS) AND JAVELIN MEDIUM ANTIARMOR WEAPON SYSTEM**

by

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June 1995

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# A COMPARATIVE ANALYSIS OF THE ACQUISITION STRATEGIES OF ARMY TACTICAL MISSILE SYSTEM (ATACMS) AND JAVELIN MEDIUM ANTIARMOR WEAPON SYSTEM


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## ABSTRACT

This thesis evaluates the acquisition strategies of two developmental weapon system programs: Army Tactical Missile System (ATACMS) and Javelin Medium Antiarmor Weapon System. The study examines the defense acquisition process through the comparison of the acquisition strategies of the programs. An analysis of the strengths and weaknesses of the two acquisition strategies and an evaluation of the similarities and differences of the two programs are provided. From this study, lessons learned are identified that can be used by other acquisition managers and their staffs to effectively manage future programs. Significant lessons learned indicate that the maturity level of technology selected for use, proper tailoring, use of realism and dual sourcing are critical to the successful development of an acquisition strategy.

## TABLE OF CONTENTS

# I. INTRODUCTION

## A. BACKGROUND

Program managers are required by the Department of Defense (DoD) to develop a comprehensive framework for planning and managing acquisition programs. The acquisition strategy for a program serves this purpose. The acquisition strategy is developed at the onset of a new program to provide an organized and consistent approach to meeting established program objectives. Successful program management requires the continuing actions of planning, organizing, directing, coordinating, controlling and evaluating the use of resources such as money, facilities and materials to meet the established program objectives within the given constraints. Therefore the acquisition strategy, which establishes the plan for meeting the program objectives, becomes very important.

One factor in the successful management of an acquisition program is the application of lessons learned from previous programs. The study of previous programs is one method that can be used to discover lessons learned. Army Tactical Missile System (ATACMS) and Javelin Medium Antiarmor Weapon System are two acquisition programs that are far enough along in the acquisition process to serve as cases to be studied with the purpose of examining the development and execution of an acquisition strategy for the acquisition of a major developmental weapon system.

## B. AREA OF RESEARCH

The area of research for this thesis is the acquisition strategies for the ATACMS and the Javelin. The thesis addresses the acquisition strategies used for both programs and makes a comparative analysis.

## C. RESEARCH QUESTIONS

### 1. Primary Research Question

What are the similarities and differences in the acquisition strategies used for ATACMS and Javelin and what can Program Managers learn from the success or failure of the execution of these programs' acquisition strategies?

### 2. Subsidiary Research Questions

a. What were the acquisition strategies used by each of the programs and were the strategies selected appropriate for these programs?

b. To what extent did the programs follow the acquisition strategies established at the start of the programs?

c. What were the strengths and weaknesses of each of the two acquisition strategies?

d. What impact does the acquisition strategy of a program have on the program's success or failure?

## D. SCOPE

This thesis is a case study of the acquisition strategies used for the ATACMS and Javelin. This thesis includes general descriptions of the systems being compared for only as much technical specificity as is necessary to compare the acquisition strategies. The study is a comparative analysis of the acquisition strategies used for each program. The study investigates the successes and shortcomings of the acquisition strategies used for each program.

## E. METHODOLOGY

The information used in this thesis was obtained from two separate data collection efforts. First, a comprehensive literature review was conducted. Second, interviews with appropriate personnel provided insight into the programs used in the study. The literature review included the examination of articles, journals, periodicals and system documentation provided by the program offices. The interviews were conducted with professors and other subject matter experts.

## F. BENEFITS OF STUDY

This study serves as a basis for future research and discussion on developing and evaluating acquisition strategies for major developmental weapon systems.

## G. ORGANIZATION

This thesis is organized in the following manner:

Chapter I provides general comments, area of study, research questions, scope, methodology, benefits of study and organization of the study.

Chapter II presents background information on the concept of an acquisition strategy. The chapter covers the evolution of the concept of acquisition strategy, how the acquisition strategy fits into the overall acquisition process, DoD guidance on development, benefits, alternative approaches and measurement criteria of acquisition strategies.

Chapter III provides a brief history of ATACMS and Javelin. It also outlines the characteristics of each weapon system and discusses the acquisition strategies used by each program.

Chapter IV is a comparative analysis of the two acquisition strategies. The focus of this chapter is the successes and failures of the acquisition strategies used by each program. This chapter also compares each program's acquisition strategy to the evaluation criteria established in Chapter II and outlines the principal lessons learned from the study.

Chapter V draws conclusions from the analysis, makes recommendations and answers the research questions.

## II. ACQUISITION STRATEGY

### A. INTRODUCTION

Development of an acquisition strategy is one of the first tasks that must be completed by a program manager at the onset of a new acquisition program. The acquisition strategy is a very important document in the acquisition process because it lays the foundation for management concepts, control measures, contracting alternatives, test and evaluation requirements, logistics support, manning and training requirements, funding issues and many other factors for the program. The program manager is forced to make key decisions very early in the program. The acquisition strategy is a means by which the program manager can evaluate and integrate these decisions so that as few options as possible are eliminated early in the program cycle. This chapter examines the concept of "acquisition strategy" and how the acquisition strategy fits into the overall acquisition process. The chapter also outlines various approaches that may be used in the development of an acquisition strategy and outline some criteria that may be used to evaluate the potential effectiveness of an acquisition strategy.

### B. EVOLUTION OF ACQUISITION STRATEGY

The concept of acquisition strategy has been studied and reviewed since the 1950s. The concept of acquisition strategy began to gain prominence in the 1970s based on reports by the Blue Ribbon Defense Panel, the Commission on Government Procurement and the publishing of Department of Defense Instruction 5000.1. These reports focused on the need for better procurement planning in the acquisition of major weapon systems. Office of Management and Budget (OMB) Circular A-109, published in 1976, further reinforced the need for improved acquisition planning. [Ref. 4:p. 26]

Numerous studies have been completed over the years which have attempted to define or to improve upon the development

and implementation of acquisition strategies. The term "acquisition strategy" was initially used to describe the overall planning process of a program. One conclusion from an early study was that a program's acquisition strategy was the mechanism which coordinated the widely dispersed activities in the acquisition process [Ref. 6:p. 129]. These past studies are useful and their result has been increased awareness of the importance of planning as a management tool in the acquisition process. [Ref. 4:pp. 26-27]

## C. ACQUISITION STRATEGY DEFINITION

The term acquisition strategy is defined in the *"Program Manager's Notebook"* published by the Defense Systems Management College as follows:

> A combination of business and technical management concepts designed to achieve program objectives within imposed resource constraints. It is the framework for managing research, development, test, production, fielding, support and other essential program activates. It is the basis for formulating functional plans; e.g., the Acquisition Plan, Test and Evaluation Master Plan, and Integrated Logistics Support Plan. [Ref. 3:p. 1.5.2]

## D. ACQUISITION STRATEGY AND THE ACQUISITION PROCESS

Policy and Guidance for the acquisition of major systems within the Federal Government was published in OMB Circular A-109 in 1976. The primary purpose of the policies outlined in the circular are "to assure the effectiveness and efficiency of the process of acquiring major systems." [Ref. 7:p. 47] Seven management objectives were outlined by OMB in Circular A-109 to be used by Federal Agencies in achieving the goal of assuring effectiveness and efficiency in acquisitions of major systems. Two of these objectives specifically address the concept of acquisition strategy. They are:

1. Accomplish system acquisition planning, built on analysis of agency missions, which implies appropriate resource allocation resulting from clear articulation of agency mission needs.
2. Tailor an acquisition strategy for each program, as soon as the agency decides to solicit alternative system design concepts, that could lead to the acquisition of a new major system and refine the strategy as the program proceeds through the acquisition process. Encompass test and evaluation criteria and business management considerations in the strategy. The strategy could typically include: o Use of the contracting process as an important tool in the acquisition program o Scheduling of essential elements of the acquisition process o Demonstration, test, and evaluation criteria o Content of solicitations and proposals o Decisions on whom to solicit o Methods for obtaining and sustaining competition o Guidelines for the evaluation and acceptance or rejection of proposals o Goals for design-to-cost o Methods for projecting life cycle costs o Use of data rights o Use of warranties o Methods for analyzing and evaluating contractor and Government risks o Need for developing contractor incentives o Selection of the type of contract best suited for each stage in the acquisition process o Administration of contracts. [Ref. 7:p. 48-49]

The Department of Defense has published Department of Defense Directive (DoDD) 5000.1, "Defense Acquisition" and Department of Defense Instruction (DoDI) 5000.2 "Defense Acquisition Management Policies and Procedures" as its implementation guidance for the acquisition of major systems. The policies and directives established in DoDD 5000.1 and DoDI 5000.2 are based on the objectives outlined in OMB Circular A-109. These documents provide DoD with policies and procedures for managing acquisition programs within DoD.

The major system acquisition process outlined in DoDI 5000.2 begins with the determination of a mission need and then flows through five distinct phases. Before the start of each phase a review is conducted, to validate the need for the system and to review the programs progress to that point. The review concludes with a decision to continue the program as

planned, modify it or terminate it. Figure 1 illustrates the acquisition process as defined in DoDI 5000.2. [Ref. 2:p. 3-4]

The program manager is required by DoD policy to develop a comprehensive acquisition strategy covering the entire life cycle of the program. The program manager has the responsibility to tailor the acquisition phases and milestones outlined in DoDI 5000.2 to fit the unique requirements and conditions of the program. [Ref 3:p. 1.5-2] Acquisition strategies are normally developed during Phase 0, Concept Exploration and Definition. Once developed the acquisition strategy is initially approved at Milestone I, Concept Demonstration Approval, and becomes Annex C of the Integrated Program Summary (IPS). The IPS is intended to provide the milestone decision authority a succinct, integrated picture of the program status so that decisions on the program can be made. The IPS is reviewed and updated at each subsequent milestone review. The acquisition strategy as a part of the IPS is also reviewed and updated at each milestone review. [Ref. 2:p. 2-8]

## E. GUIDANCE ON DEVELOPMENT

Guidelines for the development of an acquisition strategy are outlined in DoDI 5000.2. The acquisition strategy should link milestone decision reviews to events and accomplishments in development, testing and production. The strategy must reflect the relationships and scheduling of the acquisition phases and events. The primary goal in the development of an acquisition strategy should be to minimize the time required to satisfy the identified need consistent with common sense and sound business practices. The acquisition strategy should be an evolving document that becomes increasingly more definitive as the program progresses. Essential elements that should be discussed in the acquisition strategy are management, technical, resources, testing, training, deployment, support and any other aspects critical to a

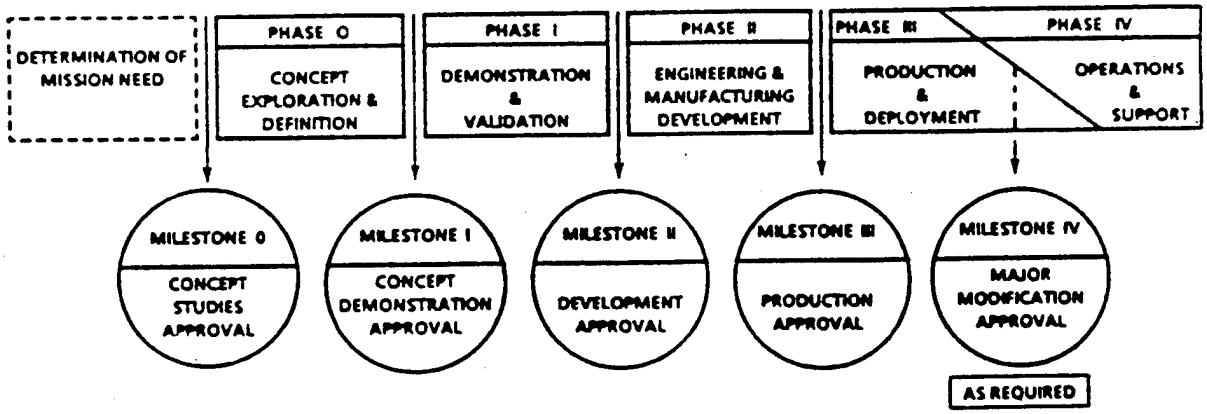


Figure 1. Acquisition Milestones & Phases

program's success. Event-based acquisition strategies, triggered by task performance, should be used as opposed to passage-of-time-based strategies. The acquisition strategy should be tailored to meet the specific needs of individual programs. The strategy should be developed in enough detail to establish a managerial approach that can be used to direct and control all aspects of the program. Clear descriptions of the performance, cost and schedule risk elements and the strategies to mitigate these anticipated risks should be included. The acquisition strategy must be kept current and updated as changes occur. [Ref. 2:pp. 5-A-1-5-A-2] Key points of an acquisition strategy are summarized in Table 1.

| | |
|---|---|
| Purpose | Provides conceptual basis of overall plan that follows in program execution |
| Emphasis | Comprehensive overview of entire program |
| Format | Tailored to each program and included in integrated program summary as Acquisition Strategy Report |
| Prepared by | Program Manager |
| When Prepared | During Concept Exploration and Definition Phase |
| When Approved | Early in acquisition process on or about Milestone I and revalidated at each milestone |
| Authority Accountability Channels | Program Executive Officer - Service Acquisition Executive |
| Policy/Procedures | OMB A-109, DoDD 5000.1, DoDI 5000.2 |

**Table 1. Acquisition Strategy Summary [Ref. 5:p. 1.5-3]**

## F. BENEFITS OF ACQUISITION STRATEGY

Successful program management requires the simultaneous coordination of planning, organizing, directing, controlling, evaluating and many other actions. A sound acquisition strategy can help the program manager to accomplish these

tasks. The program manager can benefit from his efforts in the development of a sound, sensible and comprehensive acquisition strategy. [Ref. 5:p. 3-1] Some benefits that can be realized are listed below.

**1. Provide an Organized and Consistent Approach**

The acquisition strategy can be seen as a master checklist used to ensure important issues and alternatives are considered. Development of the strategy forces the program manager to look past the near term to the end of the program, thus providing the framework for a consistent approach in the execution of the program. Inadequate planning at the initiation of a program and throughout the program as well can lead to increased diversions from the program objectives, increasing the likelihood of future cost, schedule and performance problems as the program progresses. [Ref. 5:p. 3-2]

**2. Permit Informed and Timely Decisions**

One primary purpose of the acquisition strategy is to establish priorities and integrate the functional requirements. Examples of functional requirements that must be dealt with are: evaluate and select important issue alternatives, identify opportunities and times for critical decisions and provide a coordinated approach to achieving program objectives economically and effectively. The acquisition strategy can been seen as the road map for program planning and execution. Information gained as the program progresses should be used to adjust the acquisition strategy as necessary. [Ref. 5:p. 3-2]

**3. Achieve Agreement on the Program**

The acquisition strategy becomes the baseline for preparing the plans and activities to be accomplished by the program. The acquisition strategy can be seen as a contract between the program manager and the major players, milestone decision authority, user, developer, supporter and tester, with the intent of obliging the parties to achieve the

objectives and goals of the program. The acquisition strategy should serve as the basis for all functional planning. [Ref. 5:p. 3-2]

**4. Provide Communication About the Program**

The acquisition strategy documents the reasoning and assumptions on which the program is based. It serves as a program guide and documents the progress achieved as the program progresses, thus providing an audit trail for succeeding program managers. It can also serve as a standard by which the progress of the program can be measured. [Ref. 5:p. 3-2]

**5. Build Advocacy and Support**

In today's times of ever-shrinking budgets, the importance of DoD and Congressional approval in the life cycle of a program has become very important. The acquisition strategy should be a credible and realistic approach to the accomplishment of the program objectives. Once approved, the acquisition strategy can become the main advocate for the program from DoD through Congress and the White House. The acquisition strategy can become the vehicle on which a consensus is formed that the developed approach is the best available for the development of the new system. [Ref. 5:p. 3-2]

## G. ACQUISITION STRATEGY STRUCTURE

In developing an acquisition strategy it is necessary to identify those elements that are critical to the program and select alternatives and decision points that will enable the program objectives to be met. The program manager, in developing an acquisition strategy, must be able to recognize the key areas of concern and know which options are available to address these areas. Three concerns that should be considered are strategic, technical and resource. Strategic concerns include such areas as National objectives, nature of the threat, overall program objectives and market factors. Technical concerns that should be considered are design, test

and evaluation, production and deployment. The program manager must also consider resources available for use of the program. Resource considerations include personnel and organization, schedule, business and financial, management information and facilities. [Ref. 5:pp. 3-2-3-4]

## H. ALTERNATIVES AND APPROACHES

There are numerous tools and techniques available to the program manager in the development of an acquisition strategy. The selection of specific alternatives and approaches for use in the development of the program become the basic elements of the acquisition strategy. [Ref. 5:p. 5-1] These alternatives and approaches are integrated into the acquisition strategy and can be used to measure the success or failure of the program. [Ref. 9:p. 43]

### 1. Competition

Competition can take many forms. There may be no competition at all, with justification, or competition may involve two or more competitors. Competition can take place at any stage during the acquisition process. For example during the developmental phase of the program, two or more competitors may be asked to develop conceptual designs or approaches to meet the required mission need. Competition can also be carried further into the program through the Demonstration and Validation Phase, Engineering and Manufacturing Development Phase and finally through the Production and Deployment Phase of the program. [Ref. 5:p. 5-3] The Federal Acquisition Regulation, Part 34, Major System Acquisition specifies that:

> The Program Manager shall, throughout the acquisition process, promote and sustain competition between alternative major system concepts, as long as it is economically beneficial and practical to do so.

The requirement for competition is reinforced in DoD policy.

DoDI 5000.2 requires the program manager to describe plans for the development of a competitive environment in all phases of the acquisition strategy.

Advantages of competition:

- Obtaining a lower price
- Obtaining higher quality
- Expanding the industrial base
- Providing more than one source for product innovation
- Encouraging an incumbent to be more cost conscious and receptive to the buyers' concerns [Ref. 5:p. 5-3]

Disadvantages of competition:

- Increased management of configuration control
- Quality variances
- Time and cost of bringing the second source on line [Ref. 5:p. 5-3]

**2. Concurrency**

Concurrency is the elimination, combination or overlap of one or more phases or procedures in the acquisition process. The objective of concurrency is to shorten the overall acquisition process. The shortening, however, does not come without cost. The use of concurrency often increases program risk due to the acceleration of the process. Concurrency is used most to expedite development and production so the weapon system can be fielded more quickly. Concurrency can also be used to offset delays caused by cost, funding, technical or other problems. The technology used in the program is one of the key considerations in deciding the amount of concurrency, if any, is to be used. The more complex or novel the technology the higher the risk of using concurrency becomes. [Ref. 11:pp. 24-25]

Advantages of concurrency:

- Achievement of earlier operational capability
- Reduced cost

- Design maturity or start-up problems can be identified at an early stage in the program [Ref. 5:p. 5-16]

Disadvantages of concurrency:

- Increased risk of schedule shortfall and cost overrun [Ref. 5:p. 5-16]
- Key decisions must be made early before critical information about the system's operational effectiveness, reliability, logistic supportability and readiness for production is known [Ref. 11:p. 25]

**3. Preplanned Product Improvement (P3I)**

Preplanned Product Improvement is an acquisition strategy where, during the system's concept phase, cost effective upgrading of the system is planned throughout the system's life cycle to enhance readiness, performance or availability. [Ref. 5:p. 5-46] P3I defers technologically difficult system requirements in favor of getting the system in the hands of the user faster. The deferred requirements are continued to be developed and added to the system at a later date. Items that an effective P3I strategy include are: the use of modular designs, a carefully designed architectural interface system and provisions for the anticipated growth of the system. The P3I strategy should include plans for communicating system growth requirements and for identifying technological opportunities. P3I provides flexibility to add advancements to a baseline system without disrupting the present design. [Ref. 3:p. 4.2-2]

Advantages of P3I:

- Responsiveness to threat changes and further technological advances
- Earlier initial operational capability with a baseline system
- Reduces development risks
- Increased effective operational life [Ref. 5:p. 5-

47]

Disadvantages of P3I:

- Increased nonrecurring cost during development
- Increased technical requirements in areas such as weight, size or power
- Increased complexity in configuration management
- Vulnerability to "gold plating" criticism and funding cuts [Ref. 5:p. 5-47]

**4. Standardization**

Standardization as defined by the Defense System Management College's "*Glossary of Defense Acquisition Acronyms and Terms*" is

> The process by which DoD achieves the closest practical cooperation among forces; the most efficient use of research, development, and production resources; and agree to adopt on the broadest possible basis the use of (a) common or compatible operational, administrative, and logistics procedures and criteria; (b) common or compatible technical procedures and criteria; (c) common or compatible, or interchangeable supplies, components, weapons, or equipment; and (d) common or compatible tactical doctrine with corresponding organizational compatibility. [Ref. 10:p. B-104]

Budgetary constraints placed on the Services have forced the Service's leadership to seek less costly ways of meeting mission requirements. One such way is to purchase components or equipment that are common within other Services or countries. The use of standardization must be carefully considered because it is the view of many that the use of standards is constraining to contractors and adds extra unnecessary cost. Others are of the opinion that standards represent the accumulated experience gained from other acquisition efforts and provide many useful lessons across any program. [Ref. 5:pp. 5-54-5-55]

Advantages of standardization:

- Reduction of unnecessary proliferation with the

result of a saving of manpower and money

- Risk reduction in that standard parts usually have proven performance and reliability records
- No qualification of new items is required resulting in a time saving

Disadvantages of standardization:

- Reduces contractor innovation
- Has the potential to limit competition
- Can be overly stringent resulting in excess cost

**5. Acquisition Streamlining**

Acquisition streamlining is an effort to shorten the acquisition process by the use of functional specifications in place of detailed Military Specifications or by the elimination of unnecessary requirements. [Ref. 2:p. 15-2] Streamlining is not only concerned with shortening the acquisition process it also has the goal of improving quality. DoDI 5000.2 provides several methods to accomplish streamlining. These include:

1. State requirements in terms of performance rather than design.

2. Use non-developmental items whenever possible.

3. Involve industry early in the acquisition effort to take advantage of industry expertise to improve the acquisition strategy.

4. Eliminate all non-essential data requirements.

5. Do not apply design solutions, specifications and standards prematurely. [Ref. 2:p. 10-C-1]

Advantages of streamlining:

- Achievement of earlier operational capability
- Reduced cost
- Provides the contractor with more flexibility [Ref. 5:p. 5-55]

Disadvantages of streamlining:

- Increased complexity in configuration management
- Quality variances
- Increased performance risk [Ref. 5:p. 5-55]

## I. CRITERIA

The acquisition strategy is critical in the life cycle of an acquisition program. There are certain aspects of an acquisition strategy that have proven to be beneficial in ensuring the acquisition strategy is able to meet the program objectives. Some aspects of successful acquisition strategies are discussed below.

### 1. Realism

Realism can be viewed as the reasonableness of the acquisition strategy. A realistic acquisition strategy must be based on realistic program objectives. If the program objectives are impossible to attain, then it will be impossible to develop an acquisition strategy that is realistic to achieve the unreachable goals. Realism is important in that only a realistic approach will gain support for the program at higher levels. One approach is to try to maintain the middle ground between being overly optimistic and overly conservative. [Ref. 5:pp. 3-9-3-12]

### 2. Stability

Stability is a characteristic that keeps internal or external influences from seriously disrupting the processes of the program. It would be naive to think that a program will not experience change during its life cycle but a well designed acquisition strategy can help build stability. The funding process and requirement changes are forces that work against stability. Direction, advocacy and commitment can help a program manger to achieve stability. A stable program has an acquisition strategy that clearly delineates program objectives, approaches and control procedures. Programs that show lack of control or purpose are likely targets for cuts.

Strong support from high-level positions also helps to build stability, therefore it is important to know who the key supporters are and to cultivate new ones whenever possible. Programs that can establish commitments that are not easily broken also gain stability. These commitments could be agreements with foreign governments or multi-year contracts. [Ref. 5:pp. 3-3-13-3-14]

**3. Balance**

Balance in an acquisition strategy is a condition of equilibrium between program objectives. Almost all programs must work under constraints, therefore the limited resources must be split between program objectives to best achieve the overall goals of the program. Balance can also be viewed in terms of risk. In this case a balanced program is one in which all risks are approximately equal. Balance is an important aspect of an acquisition strategy because over emphasizing one objective could cause the program to fail to meet other objectives. Fully understanding the priorities, risk, resource requirements and relationships for each objective will help the program manager to develop a balanced strategy. Clear understanding of mission requirements and alternative approaches is also key to the successful development of an acquisition strategy that is balanced. Some ways to achieve balance are priority analysis, resource allocation and cost/risk sharing. [Ref. 5:pp. 3-14-3-17]

**4. Flexibility**

Flexibility is an acquisition strategy's ability to successfully adapt to changes that occur. The completion of "what if" analysis can prove to be very useful in achieving flexibility. Change is inevitable so it is important to have a strategy that deals with change and minimizes its impact. One key to developing a flexible acquisition strategy is to have the ability to predict areas with a high probability of change. Every possible contingency cannot be planned for so it is important to focus on significant areas. Dual sourcing,

P3I and management reserves are some ways that can be used to achieve flexibility. [Ref. 5:p. 3-17]

**5. Controlled Risk**

Risk in an acquisition strategy is a measure of the probability and consequence of not achieving a defined program objective. OMB Circular A-109, DoDD 5000.1 and DoDI 5000.2 specifically state that risk must be addressed, but it is not always easy to assess risk. Risk assessment is the underlying analysis approach in the development of an acquisition strategy. It can become the basis of determining conformance to the other criteria mentioned: realism, stability, balance and flexibility. The other criteria can be viewed as the elements necessary to minimize program risk throughout the acquisition strategy. [Ref. 5:p. 3-20]

## J. SUMMARY

The development of an effective acquisition strategy at the initiation of a program can yield tremendous benefits throughout the life cycle of the program. Therefore, understanding the elements that should be considered and having knowledge of methods that have succeeded in the past in the development of an acquisition strategy is very important. This chapter has made an effort to enhance overall understanding of an acquisition strategy. This chapter has defined the term "acquisition strategy", outlined how an acquisition strategy fits into the acquisition process, outlined guidance provided by DoD on the development, listed some benefits derived from the development, outlined alternative approaches and listed some evaluation criteria for use in the development of an acquisition strategy.

## III. SYSTEM OVERVIEWS: ATACMS AND JAVELIN

### A. INTRODUCTION

The Army Tactical Missile System and Javelin are both Acquisition Category (ACAT) ID programs that fall under the control of the Program Executive Officer (PEO) Tactical Missiles located at Redstone Arsenal, Huntsville Alabama. This chapter provides a brief overview of each of the weapon systems. The chapter also examines the acquisition strategies employed in the initiation of ATACMS and Javelin and how the program managers executed the strategies as the programs progressed.

### B. ARMY TACTICAL MISSILE SYSTEM (ATACMS)

#### 1. Background

The Army Tactical Missile System (ATACMS) is a ground launched, inertial guided missile system consisting of a surface-to-surface ballistic missile designed to be used in the deep attack of enemy forces at ranges beyond the capability of existing rockets. The missile was designed for two basic configurations. The first being antipersonnel and the second being anti-material. ATACMS missiles are fired from a Multiple Launch Rocket System (MLRS) modified M270 launcher. The anti-personnel configuration, Block I design, is loaded with M74 bomblets which are effective against personnel and light skinned equipment. The Block I missile warhead dispenses the bomblets over the designated target. The antimaterial, Block II design, contains multiple anti-material submunitions which are dispensed over the designated target. The prime contractor for the production of ATACMS is the Loral Vought Systems (LVS) located in Dallas, Texas. [Ref. 19:p. 12]

#### 2. Mission

The mission of ATACMS is to provide the Corps Commander with the capability to interdict and destroy second-echelon enemy forces. The missile is designed to operate in near all-

weather conditions and is intended to be used on high-priority targets such as tactical surface-to-surface missile sites, air defense systems, logistics elements and command/control/ communication sites. [Ref. 15:p. 145]

### 3. Technical Description

The major components of ATACMS can be broken down into the following areas: guidance and control, warhead, propulsion and launcher. Figure 2 is an illustration of the Block I ATACMS missile configuration.

#### *a. Guidance and Control*

There are two major electronic subsystems that provide guidance and control for ATACMS. Guidance is provided by the H700-3A Ring Laser Gyro Missile Guidance Set. The guidance set provides the navigation, guidance, weapons dispensing, autopilot and communications for the missile while in flight and for ground operations. This guidance system's operability was proven during the Assault Breaker Demonstration. [Ref. 13:p. 23] The ring laser gyro technology is also in use in commercial applications such as aircraft navigational equipment. The control actuation system (CAS) provides control of the missile. The CAS consists of small motors which turn the fins, located on the rear of the missile body, to control the flight of the missile. [Ref. 28:p. 543]

#### *b. Warhead*

Several warheads were planned for ATACMS. The Block I missile consists of 1000 M74 antipersonnel/materiel (APAM) bomblets. The payload is dispersed by a central exploder, which blows off the nosecone skin, distributing the bomblets over the target. These APAM bomblets were developed and used in a previously developed weapon system, Lance. The planned Block II missile caries smart submunitions that take advantage of infrared technology. The infrared technology allows the submunitions to lock-on and attack individual targets. Block II missiles carry as many as 21 submunitions. [Ref. 27:p. 42]

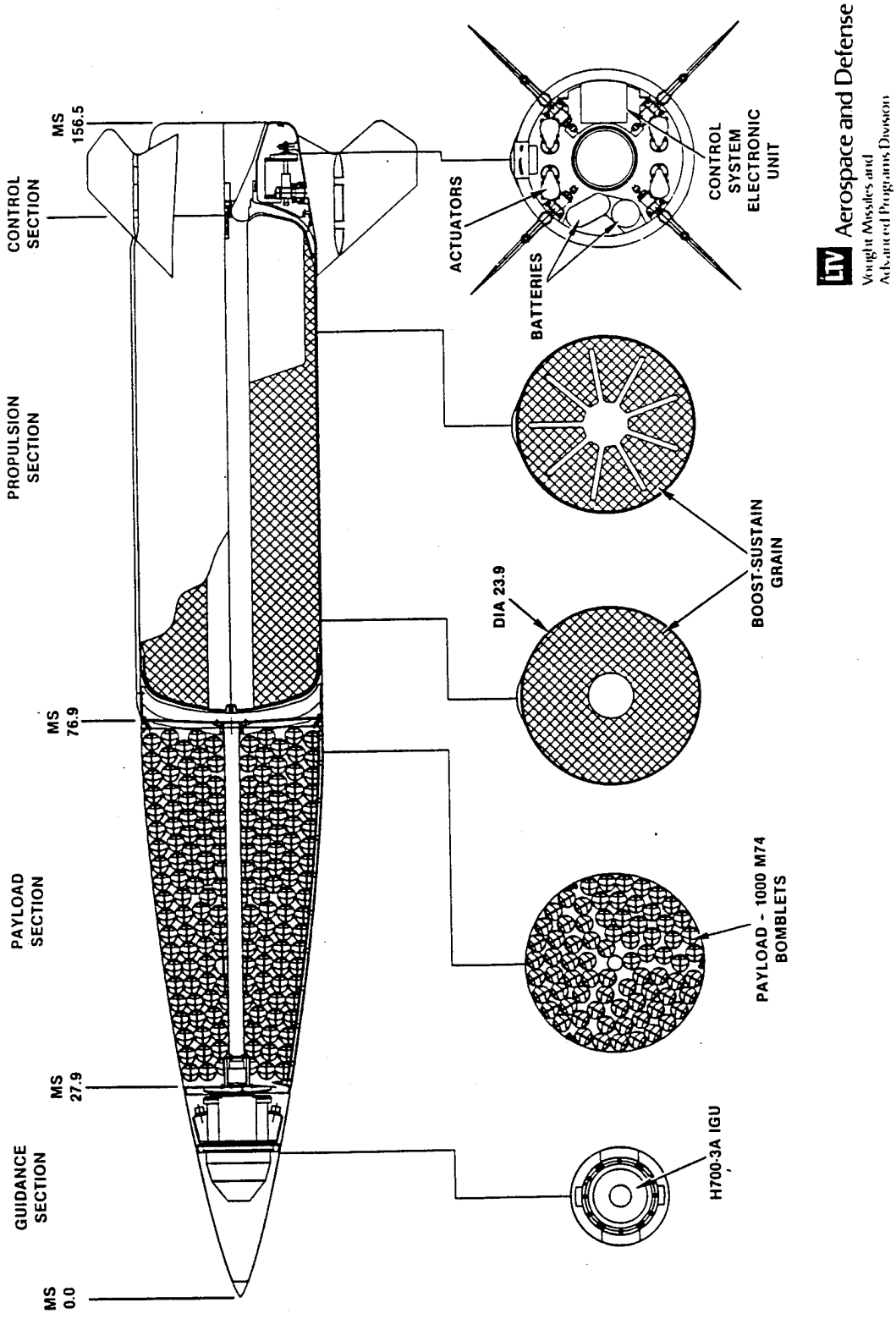


**Figure 2. Block I Missile Configuration**

*c. Propulsion*

The propulsion system used on the ATACMS is a solid rocket motor using Arcademe 360 propellants. This same type of motor is also used for the MLRS rocket and made by the same manufacturer that makes the MLRS rocket, Atlantic Research. The propellent, ignitor and motor cases are of standard composition and construction. [Ref. 12:p. 1]

*d. Launcher*

The ATACMS launcher is a modified M270 MLRS launcher. The missile was integrated into the existing launch pod container and adapted to the M270 launcher. The Program Manager in 1986, Colonel Thomas Kunhart, saw the integration as the most difficult task facing the Program Office at the time. [Ref. 26:p. 69]

**4. Technical History**

The genesis of ATACMS can be traced to the culmination of a series of efforts to improve the overall range, accuracy and effectiveness of mid-range missile systems. Based on changes to Army doctrine derived from the move to the Air-Land-Battle concept, the need for a weapon system that allows the Corps Commander to attack targets within his area of influence was required. The following is a summation of the events/programs that ATACMS's acquisition strategy was based on. [Ref. 13:p. 1]

The "Assault Breaker" technology demonstration program begun in 1978 by the Defense Advanced Research Projects Agency (DARPA) proved that the technology existed to attack enemy second-echelon forces beyond the capability of the existing cannons and rockets. The Army established a special task force in 1981 to continue the technology demonstration begun under "Assault Breaker". The Special Task Force's mission was to develop the requirements for a Corps Support Weapons System (CSWS) to engage high priority targets beyond the range of existing weapons. The Air Force was working on the development of a similar weapon system at the same time. The

Under Secretary of Defense for Research and Engineering (USDRE) directed the formulation of a joint program in 1983 which combined the Army's and the Air Force's programs into one program called the Joint Tactical Missile System (JTACMS). The Air Force ended its participation in the program in 1984. The Army requested and received DoD Approval to continue the program. The Army completed and received approval of the Required Operational Capability (ROC), now the Operational Requirement Document (ORD), in May 1985 and the program was renamed the Army Tactical Missile System (ATACMS). [Ref. 13:p. 1-2]

**5. Acquisition Strategy**

Based on the studies conducted prior to program initiation, "Assault Breaker" and technical maturity assessments, the ATACMS acquisition strategy called for the elimination of Phase 0, Concept Exploration and Definition, and Phase I, Demonstration and Validation. The elimination of the acquisition phases was made possible due to the maturity level technology selected for use on ATACMS. The technologies were developed and proven during the past studies. ATACMS was to begin with a 48-month Phase II, Full-Scale Development (FSD), now Engineering and Manufacturing Development. The plan called for the award of a development contract with two low-rate initial production (LRIP) options. The second LRIP option was to be used if problems were encountered during the initial testing of the missile and delays to the program schedule. The completion of LRIP was to be followed by full-rate production (FRP). The use of P3I was planned to reduce development cost and to allow for improvement of the weapon system's warhead. The missile was to be designed so that it could accommodate additional warheads. ATACMS was also designated as a Defense Enterprise Program. This designation allowed the program office to streamline the acquisition process by eliminating all requirements except those required by statute. The plan was to use a multi-year procurement for

the production buy of the missiles. An alternate strategy of annual procurements was established in the event that Congress failed to approve the planned multi-year procurement. The strategy called for a first unit equipped (FUE) date of September 1990 and production runs until 1996. Figure 3 is an illustration of ATACMS schedule. [Ref. 15:p. 1]

Other aspects of ATACMS's acquisition strategy included solicitation and contract streamlining, early troop involvement with continuous test and evaluation, concurrency, hard-tooled prototypes and performance/quality guarantees. Solicitation and contract streamlining was an effort to specify requirements as generally as possible in all RFPs to leave the contractor with as much flexibility as possible. The plan was also to prevent "goldplating" by managing the ROC so that reliability, availability and maintainability (RAM) factors were not inflated past the proven technology. Early troop-in-the-loop involvement was planned beginning in the development test (DT). The early troop involvement was planned to allow the user to interact with the hardware early to minimize changes generated in the development process. Concurrency of production and testing was built into the program to reduce overall acquisition time. Hard-tooled prototypes required the contractor to establish and validate the production line early to help mitigate schedule and technical risk. Performance/quality guarantees were to be added through the inclusion of a warranty clause on all missiles to be bought. The warranty as planned was a three year warranty which required all missiles to meet performance, design and construction requirements and to be free of defects. [Ref. 13:pp. 60-61]

The ATACMS acquisition strategy also included plans for the execution of FSD contracts. Two contracts were to be awarded during FSD. The first contract was for the development of Missile/Launch Pod Assembly (M/PLA or M39) and the second contract was for the integration of the M39 with

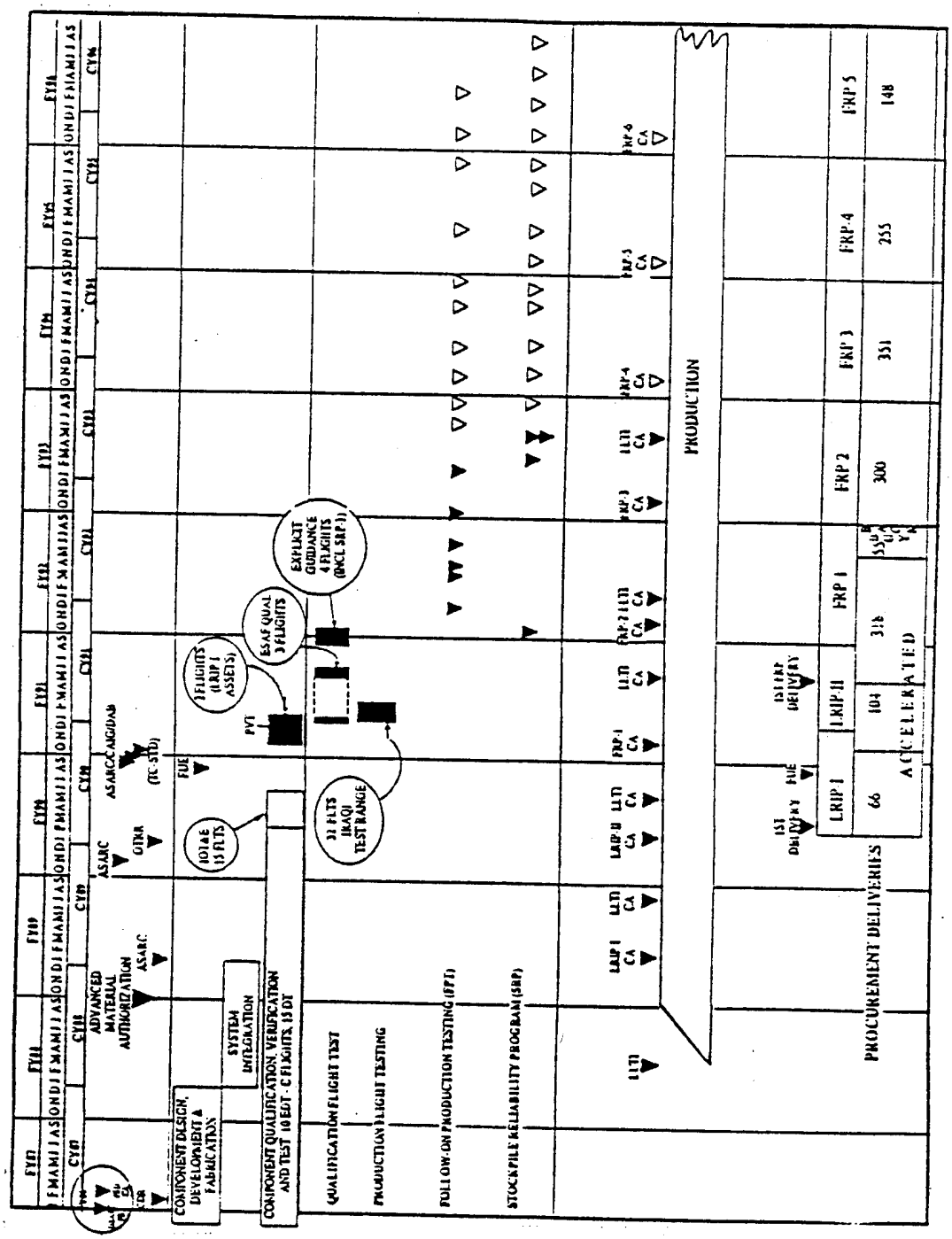


Figure 3. ATACMS Schedule

the MLRS launcher. The development contract would include production options and was to be a competitive award using a fixed-price-incentive-firm (FPIF) contract. The contract called for continuous low-rate production deliveries during FSD with a transition to FRP upon the completion of a successful LRIP and testing. Subcontractor competition was to be maximized through the prime contractor. The FSD integration contract was to be sole source to LTV, manufacturer of MLRS, with an FPIF contract. The full-rate production was to be competitively obtained by not-to-exceed (NTE) price options in the FSD development contract. The plan was to minimize the commitment to production before the testing was complete and to require the contractor to maintain a certified production line. The plan was also to explore dual source requirements for major missile system components. [Ref. 16]

**6. Acquisition Strategy Execution**

The ATACMS acquisition strategy was briefed to and approved by the Vice Chief of Staff of the Army, the Defense Review Board, the Army Systems Acquisition Review Council (ASARC) and the Defense Systems Acquisition Review Council in May 1985. [Ref. 15:p. 1] The execution of the strategy began in June 1985 with the release of the FSD RFP and the FSD integration RFP, sole source to LTV. Competition for the development contract was restricted to the three contractors, Boeing Aerospace, Martin Marietta Aerospace and LTV, which had previously been awarded contracts for the JTACMS. Two proposals were received on 10 October 1985 for the development contract, one from LTV and the other from Boeing Aerospace Company. LTV was determined to be the winner of the competition. LTV was awarded two contracts in March, 1986 one for the development and the other for the integration of the M39 as previously planned. [Ref. 13:p. 8]

The FSD development contract covered 48 months and required the contractor to provide design, development,

fabrication, and test support necessary to obtain the LRIP decision. The development contract included options for FSD engineering/test support, two LRIPs, and production. The production option covered all known production requirements on an NTE price basis, to be finalized with firm-fixed-price (FFP) contracts prior to exercising the option. An FPIF contract was used with cost as the only incentive. The target profit was 11% of the target cost and the ceiling price was 125% of the target cost. A share ratio of 70% Government and 30% contractor was used. Management reserve in the amount equal to the Government possible liability in the occurrence of a cost overrun was established. [Ref. 13:pp. 8-9]

The FSD integration contract was awarded sole source based on LTV's experience in the design, development and manufacturing of the MLRS. LTV was viewed as the only contractor with the ability to successfully complete the integration of the M39 and the MLRS. The contract awarded was an FPIF with cost as the only incentive. Target profit was established at 10% of target price and ceiling price was set at 125% of target price. The contract was funded to the ceiling price amount. [Ref. 13:p. 13]

Developmental testing was begun in April 1988 and the ASARC approval to exercise the LRIP I option was given on 5 January 1989. [Ref. 19:p. 12] As LRIP I began Singer, provider of the CAS, went out of business. The result of losing Singer was a 6-month schedule slippage. The completion of developmental testing was delayed by six months due to this problem. Simmonds Precision was qualified as a new source for the CAS and a contract was awarded March 1988. In order to gain the required time to certify the new subcontractor, the program manager requested approval to exercise the LRIP II option. Approval to exercise the LRIP II option was granted on 20 December 1989. [Ref. 18:p. 43] Developmental testing was successfully completed in March 1990. The Initial Operational Test and Evaluation (IOTE) was conducted from 5

March 1990 to 8 June 1990 and was successfully completed. On 2 November 1990 a Defense Acquisition Review Board (DAB) was held to make a Milestone III decision to enter into production. Approval was given to ATACMS to enter FRP under the FY 91 production option. [Ref. 19:p. 12]

The original schedule called for ATACMS to be deployed to U.S. Army Europe (USAREUR) with an FUE of September 1990. The schedule was changed in support of Operation Desert Shield. The missiles scheduled to be sent to USAREUR were diverted to South West Asia (SWA). In order to meet the SWA requirement LRIP was accelerated twice. The SWA deployment was successfully completed in August 1990. Throughout the war, ATACMS was fired 32 times with no failures. [Ref. 18:pp. 36-37]

The acceleration of LRIP caused a four month gap in production between LRIP II and FRP. The program manager requested and received supplemental funding to accelerate FRP-1 in March 1991 to preclude the gap in production. A solicitation for a multi-year contract for the production of ATACMS was issued to LTV in April 1991. The first FRP-1 missiles were completed and delivered ahead of schedule. Deployments to Europe and Korea began in July 1991 and September 1991, respectively. [Ref. 18:p. 36-37]

The program is currently continuing production and deployment with all deployments being made on schedule. Possible improvements to ATACMS are all being worked by the program office. Potential improvements include extending the range, diversifying the sub-munitions and the installation of Global Positioning System. [Ref. 18:p. 37]

## C. JAVELIN MEDIUM ANTIARMOR WEAPON SYSTEM

### 1. Background

Javelin is a medium-range, man-portable, fire-and-forget antiarmor system for use in rapid deployment operations, rough terrain and air assault operations. Javelin is to replace the Army's current medium antiarmor weapon, Dragon. Javelin

consists of two major components: a missile sealed in a disposable launch tube assembly and a reusable command launch unit (CLU). The missile is comprised of a seeker, guidance electronics, warhead and fuse, propulsion system and control actuator system. The missile is considered to be a "wooden round", that is, the missile requires no field level maintenance during its expected shelf life. The CLU may be used in the stand-alone mode for battlefield surveillance and target detection. Javelin has the capability of being fired in either top attack or direct fire mode. The system is capable of both day and night operation. Javelin features a soft launch capability that allows the weapon to be fired from enclosed areas such as a building or fighting position. Texas Instruments and Martin Marietta are the prime contractors for Javelin under a joint venture approach. [Ref. 20:p. J-i]

**2. Mission**

The mission of Javelin is to defeat both conventional and reactive armor. Javelin may also be used to defeat other targets that may be encountered on the modern battlefield. [Ref. 20:p. J-i]

**3. Technical Description**

The critical technologies of the Javelin weapon system can be grouped into the following categories command launch unit (CLU), tactical round, guidance and control and propulsion. [Ref. 20:p. C-10]

***a. CLU***

The CLU is the reusable component of the system. It consists of an integral visible day telescope and a long-wavelength infrared nightsight with wide and narrow fields of view, a round launching latch, a battery box/power connector, a test connector and a handgrip/control housing. A monocular eyepiece assembly allows the user to view the CLU nightsight video, missile seeker video, CLU day telescope and system status information. The CLU is used for battlefield surveillance, target acquisition, missile launch and damage

assessment. Figure 4 is an illustration of the CLU Equipment Set. [Ref. 20:p. C-14]

*b. Tactical Round*

The tactical round is the expendable item of the system. It consists of the missile and disposable launch tube assembly with replaceable battery cooling unit (BCU). The missile is comprised of four sections; guidance section, midbody section, propulsion section and control actuator section (CAS). The midbody/warhead section includes a full caliber shaped warhead, the electronic safe-arm fuse device and eight midbody wings. The CAS consists of two circuit card assemblies, the missile thermal battery and four direct current brushless motors with integral ball screws which are connected to the thrust vector control and control fins with crank-arm linkages. Figure 5 depicts the tactical round. [Ref. 20:pp. C-13-C-14]

*c. Guidance and Control*

The guidance section consists of a seeker head and a guidance electronics unit (GEU). The guidance and control section is located in the warhead. The seeker collects infrared (IR) energy from the target scene through an IR transparent dome. The energy is passed through a lens assembly to an element mercury-cadmium-telluride focal plane array (FPA) detector. The detector is mounted on a rate stabilized gimbal platform. A dewar/cryostat provides fast cool down of the seeker FPA and maintains the operating temperature. Cooling is provided by a replaceable battery cooling unit during target acquisition and lock-on. During missile flight, cooling is provided by an on-board gas bottle. The GEU is part of the guidance section and is located behind the seeker and in front of the midbody/warhead section. The GEU includes four single-sided surface mount technology circuit card assemblies, a power distribution assembly, the precursor warhead and the roll rate gyro. [Ref. 20:pp. C-13-C-14]

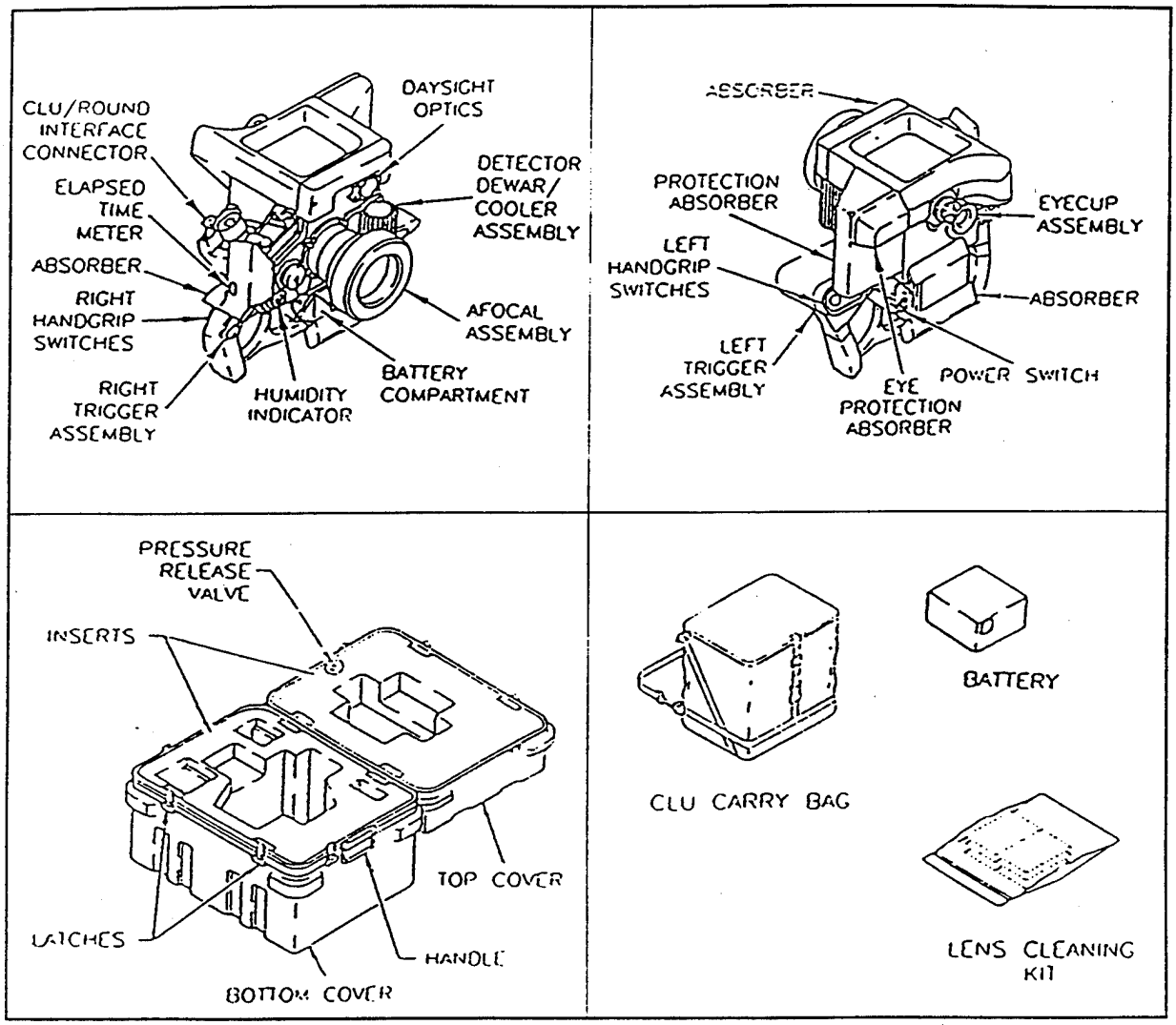


**Figure 4. CLU Equipment Set**

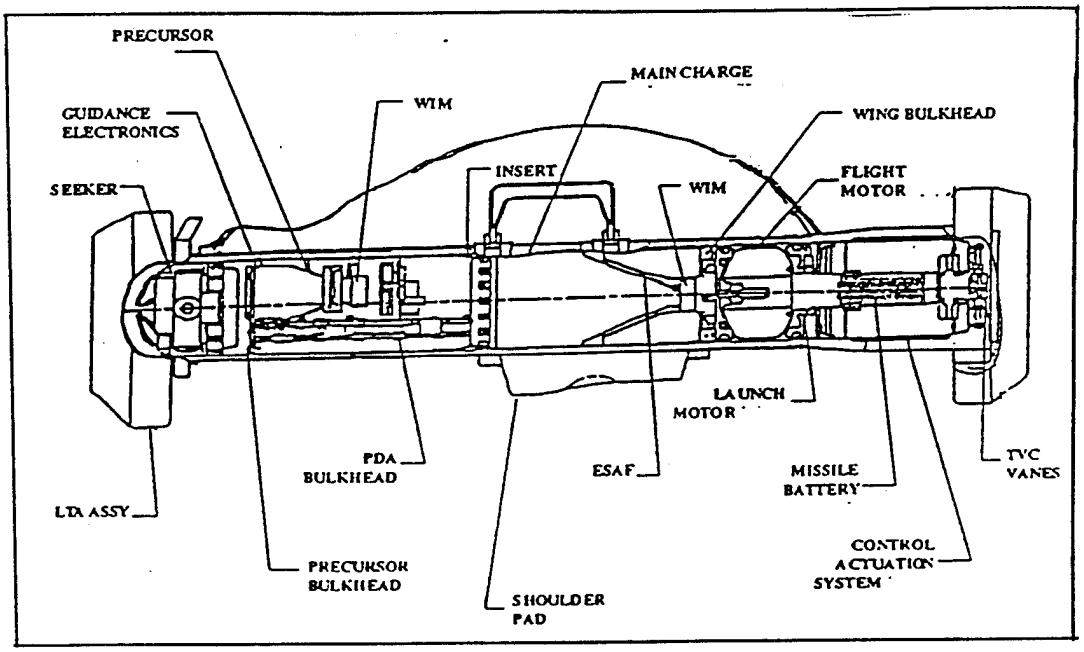


**Figure 5. Tactical Round**

The FPA is one of the most critical components of the guidance system. The FPA technology provides the eyes for both the infrared seeker and the CLU's thermal sight. This technology provides the Javelin with its fire-and-forget capability. The fire-and-forget system is basically a small computer, located in the front of the missile, that recognizes the infrared picture of the target and guides the missile to it. The heart of this system is the FPA, which is smaller than a fingernail. The FPA allows the system to see through varying degrees of darkness, haze, dust, fog and smoke. Advancements provided by the FPA include improvement in infrared performance, increased resolution, enhanced target definition, improved tracking and a smaller overall system. [Ref. 23:p. 3]

***d. Propulsion***

The propulsion section is a dual-in-line assembly of the launch and flight motor. The propulsion section provides missile propulsion while the missile is in the launch tube as well as propulsion force to the missile during flight. The unit also functions as part of the missile airframe. [Ref. 20:p. C-14]

**4. Technical History**

The history of Javelin can be traced to the Infantry Man-portable Antiarmor/Assault Weapon System (IMAAWS)/Rattler Program and Tank Breaker Program. Both of these programs were based on the requirement to develop a missile system that was portable by one man, weigh under 35 pounds, have a reusable guidance unit, low backblast and firing signature and reduce the amount of time the gunner is exposed to enemy fire. The IMAAWS/Rattler Program studied the use of a focal plane array seeker that had been developed under an earlier DARPA study, Tank Breaker. The idea of a fire-and-forget missile was also examined under the IMAAWS/Rattler Program. Under the IMAAWS/Rattler Program six contractors submitted proposals based on the requirements listed above. In January 1983, the

funding for the IMAAWS/Rattler was canceled and the program office was closed. However, these studies did prove that the potential for a weapon that could meet the requirements listed above existed. [Ref. 21:p. 1]

During the FY 85 budget process, Congress informed the Pentagon that greater cooperation and elimination of duplication in the area of antiarmor was expected from the Services. In response to the Congressional request DoD was required to submit a new Antiarmor Master Plan. One element of the Antiarmor Master Plan submitted called for the replacement of the current medium antiarmor weapon system, Dragon. The Antiarmor Weapon System - Medium (AAWS-M) Program, which was eventually renamed Javelin, was begun to meet the requirement to replace Dragon, thus the beginning of the Javelin Program. [Ref. 21:pp. 1-2]

**5. Acquisition Strategy**

Based on the studies conducted prior to program initiation, Javelin's acquisition strategy was to begin with a Proof of Principle (POP) Phase in which three alternative approaches would be studied. The POP Phase can be viewed as Phase I, Concept Demonstration and Validation. This POP Phase was to be 27 months long and the result would be a decision on which technical approach to pursue for the remainder of the program. The plan was for open competition during the POP Phase. The winner of the POP was to be required to select another contractor, capable of producing the system, as a team member. The idea behind the teaming approach was to establish two qualified sources for system production. [Ref. 20:p. C-10] One contractor team was to be chosen at the end of the POP for FSD and LRIP. The FSD was to last 36 months. The members of the contractor team for the FSD were to compete for the full-rate production of the system. Figure 6 depicts Javelin's POP schedule and Figure 7 is an illustration of Javelin's EMD schedule. [Ref. 22]

The strategy called for the earliest possible FUE date

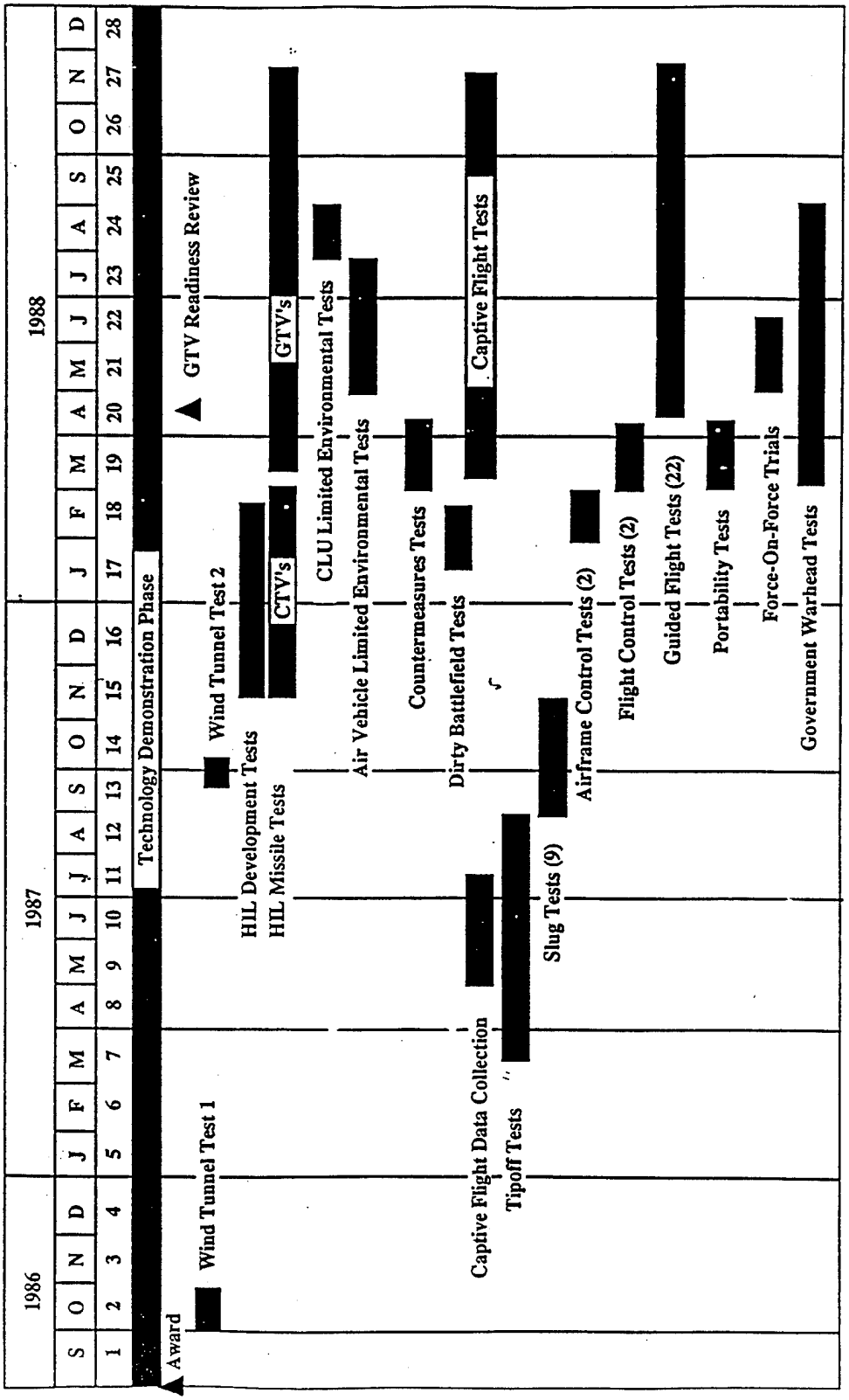


Figure 6. Proof of Principle Schedule

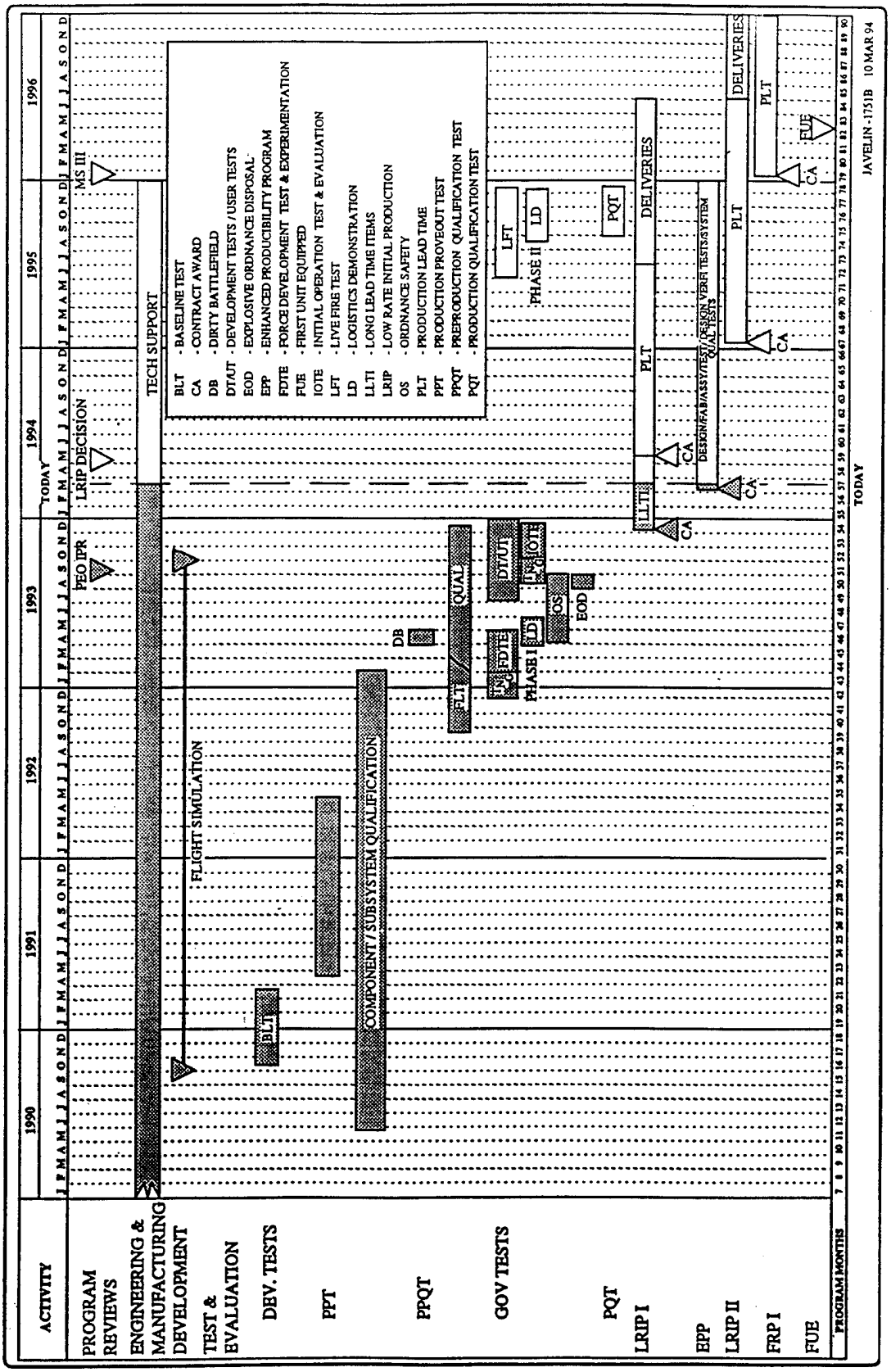


Figure 7. Javelin EMD and Production Schedule

and planned to achieve the early FUE by the use of concurrency. FSD competition was to be limited to the contractors who successfully competed in the POP. Risk reduction measures outlined in the strategy included a plan to use NTE prices in LRIP and demonstrated success in POP. The plan also called for the use of dual sources for critical system components. The FSD contract was to be a cost-plus-incentive-fee (CPIF) with two LRIP options. [Ref. 22]

**6. Acquisition Strategy Execution**

The execution of Javelin's acquisition strategy was begun with the release of the POP RFP in May 1986. Three contracts were awarded for the POP to three contract teams. The teams consisted of Ford Aerospace/General Dynamics, Hughes Aircraft/Honeywell and Texas Instruments/Martin Marietta. [Ref. 21:p. 1] The Army evaluated three technology concepts during the POP Phase. The three concepts tested were the carbon dioxide ($CO_2$) laser beam rider (LBR), the imaging infrared (IIR) fiber optic guidance and the IIR fire-and-forget. The IIR fire-and-forget guidance technology was selected for the transition to FSD. The recommended approach was approved at a DAB review in June 1989. Approval was also given for Javelin to proceed into the next acquisition phase, FSD. [Ref. 20:pp. C-1-C-2]

The next step in the Javelin Program was the start of FSD. The Joint Venture team of Texas Instruments/Martin Marietta was selected to carry its version of the Javelin through FSD. The CPIF FSD contract was awarded June 1989. The Javelin Program experienced several problems during the planned 36-month FSD. The problems included extensive cost growth and technical problems with weight and the focal plane array development. The cost growth that occurred during FSD was over 2.5 times greater than the original contractor cost estimate. The technical problems also lead to an inability to meet the planned schedule of 36 months for FSD. Based on the problems encountered by Javelin during FSD, the program

manager recommended that the program be restructured by increasing the FSD from 36 months to 54 months. The Defense Acquisition Executive (DAE) approved the proposed program restructuring in September 1991. [Ref. 20:p. C-2]

The impacts of the restructured program were a delay in IOTE by 20 months to October 1993 and FUE by 26 months to April 1996. The DT and IOTE were successfully completed by October 1993. Another impact of the restructuring was that the LRIP options placed in the FSD contract were canceled. The LRIP options were cancelled because of OSD's position that the original LRIP option's pricing placed too much risk on the contractor. [Ref. 20:p. J-6] The DAB proceedings for the LRIP decision were held in May 1994. The LRIP was approved and awarded to Texas Instruments/Martin Marietta. [Ref. 20:p. C-2]

Based on the restructuring of the program, the acquisition strategy for the remainder of the program has been changed. The new strategy maintains a sole source to Texas Instruments/Martin Marietta Joint Venture through two LRIPs and the first two FRP buys. This strategy was adopted in order to achieve cost savings based on lower overhead rates of maintaining the same contractor. Three bids will be requested for all production buys occurring after the completion of the first two buys. [Ref. 20:p. C-10] The program is currently in the first of the two planned LRIPs and the Milestone III decision to enter into FRP is scheduled for the second quarter of 1996.

## D. SUMMARY

This chapter presented brief system overviews of ATACMS and Javelin. The brief technical history of each program was presented to provide information on which each of the system's acquisition strategies were formulated. This chapter also outlined the acquisition strategy developed for each program and how each program progressed through the acquisition process.

# IV. COMPARISON AND ANALYSIS

## A. INTRODUCTION

This chapter compares and analyzes the acquisition strategies used by ATACMS and Javelin. This chapter outlines the similarities and differences in the two programs. This chapter also examines the strengths and weaknesses of each program's acquisition strategy. This chapter concludes with a comparison of both programs' acquisition strategies to the five evaluation criteria discussed in Chapter II and a summary of the principal lessons learned from the study.

## B. SIMILARITIES

The ATACMS and Javelin Programs have many similarities. Both are ACAT ID major weapon system acquisitions that fall under the same PEO, Tactical Missiles located in Huntsville, Alabama. Both systems were developmental surface missiles and were based on studies previously conducted by the Defense Advanced Research Projects Agency. Based on the results of the studies conducted, both programs skipped at least one phase of the acquisition process. ATACMS began in Phase II, Engineering and Manufacturing Development (EMD), and Javelin began in Phase I, Demonstration and Validation. Support from the Army for both programs was strong. Both programs held competitions to determine which contractor to use for the FSD prime. The FSD prime contractors selected for both programs were major defense companies with excellent business reputations in defense contracting. Lastly, both weapon systems have been successfully developed with ATACMS currently in FRP and Javelin currently in LRIP.

## C. DIFFERENCES

In spite of the similarities listed above, these weapon system acquisition programs did have some differences. The key differences discussed are summarized in Table 2.

| | ATACMS | Javelin |
|---|---|---|
| Technology Used | Mature | State-Of-The-Art |
| EMD Length | 48 Months | 36 Months |
| EMD Contract Type | FPIF | CPIF |
| Rebaselining Required | No | Yes |
| Defense Enterprise Program | Yes | No |

**Table 2. Summary of Differences**

### 1. Maturity of Technology

The most significant difference was the maturity of the technologies selected for use by each program. The guidance and control, warhead and propulsion systems selected for use on ATACMS were within the state-of-the-art. The technologies for these ATACMS's systems had already been proven on past weapon systems and or other commercial products. On the other hand, one key component, the FPA which provides the fire-and-forget capability and is part of the CLU and the guidance system, chosen for use in the Javelin program was outside the state-of-the-art, meaning the technology was yet to be invented. Thus, the Javelin program was one of true invention. Therefore, there was an inherent level of high risk associated with the development of Javelin well above that of ATACMS. This inherent level of high risk is the major factor that should have driven the development of Javelin's acquisition strategy as the maturity of the technology affects many aspects of the acquisition strategy such as: how the program should be tailored, schedule length and contract types. This statement is supported by the development of both systems' acquisition strategies. Based on the technology selected, the decision process used to develop ATACMS's acquisition strategy was successful, while the decision process used for the Javelin Program failed to successfully analyze the impacts of the maturity of the technology and a

strategy was developed with an EMD schedule that proved to be unattainable.

**2. Length of EMD**

ATACMS's acquisition strategy called for a 48-month EMD, while Javelin's acquisition strategy had a 36-month EMD planned. ATACMS allowed adequate time for the contractor to complete EMD as evidenced by the program's successful completion of EMD on schedule. Javelin's acquisition strategy did not allow the contractor enough time to complete EMD. Therefore, the program had to be restructured from a 36-month EMD to a 54-month EMD. The major reason the Javelin Program was unable to meet the scheduled 36-month EMD was the occurrence of technical problems.

The technical problems experienced in the development of Javelin were mainly from two areas. First, the development of the FPA was much more difficult than anticipated and even once developed the manufacturing process for the FPA proved to also be a problem. Texas Instruments, the EMD prime contractor, was never able to develop or economically manufacture the FPA for the missile guidance system. An alternate supplier, Santa Barbara Research center, had to be found for the development and production. Second, the weight requirement of 45 pounds for total system weight, later rebaselined to 49.5 pounds, proved to be a tremendous management problem for the program office. The weight problem centered on engineering; how to put so many new capabilities into a small package. In order to meet the weight requirement, the majority of the components of the system had to be redesigned with weight reduction as a goal. System weight became such an issue in the Javelin Program that individual component weights were measured and tracked in grams. The weight requirement became one of the major cost drivers in the program and contributed greatly to the program's cost overrun problem. The technical problems also resulted in schedule delays for the Javelin Program. The maturity and complexity of the technology selected for use on

a program should be one of the key considerations as to the amount of time allowed for the development process.

### 3. Contract Types

The programs used different contract types for EMD. ATACMS used an FPIF contract for EMD and Javelin used a CPIF contract. The technology used for ATACMS had already been proven on previous weapons and or commercial use. Therefore, ATACMS was able to use a fixed-price type contract for EMD. The fixed-price contract worked well for ATACMS as EMD was completed on cost and schedule. Javelin's technology was outside the state-of-the-art. Based on this fact, a cost contract was used for Javelin's EMD. Javelin experienced a tremendous cost management problem during EMD. EMD cost grew over two and a half times that of the contractor's original estimate. Cost contracts by their nature may incentivize a contractor to buy-in on the contact, meaning that the contractor under bids intentionally in order to win the contract. Buying-in can cause many problems for the program office with the most likely of these being a cost overrun. There is evidence that Javelin's contractor bought-in on the contract, based on two facts. First, the contractor's estimate was much lower than the Government's estimate and second, the tremendous overrun that occurred in the execution of the EMD contract. The inclusion of methods to prevent buying-in such as the use of cost realism as an evaluation criterion during the source selection process may have also helped to prevent the cost overrun.

The fixed-price contract incentivised the contractor for ATACMS to be more cost conscious than did the cost contract used for Javelin because the ATACMS's contractor knew that any cost overrun would come out of his pocket. The fixed-price contract placed the majority of the risk on the contractor, while the cost type contract used by Javelin placed the majority of the risk on the Government. The fixed-price contract also required less administration, provided the

contractor with more freedom and did not require the use of cost/schedule control systems criteria.

Another factor that may have contributed to ATACMS success is the fact that the prime contractor knew that he would also be awarded the production contract. Therefore, the ATACMS's prime contractor knew the successful completion of EMD was a guarantee for future business. Javelin's strategy called for a competition between the two members of the Joint Venture Team, preforming the EMD contract, to determine who would win the production contract. This type of strategy may have caused unseen animosity between the two members of the Joint Venture Team, which could have contributed to Javelin's problems during EMD.

**4. Defense Enterprise Designation**

ATACMS was designated as a Defense Enterprise Program, while Javelin was required to follow the procedures for a normal major developmental weapon system acquisition outlined in DoDD 5000.1 and DoDI 5000.2. The Defense Enterprise Program Designation was intended to allow the ATACMS program more flexibility. The designation gave the ATACMS Program Office the authority to drop all requirements placed on the program except those required by statue. This allowed ATACMS more flexibility than Javelin enjoyed. However, this designation did not provide as much flexibility for ATACMS as was intended. Colonel Dave Matthews, a past ATACMS Program Manager, felt that the Defense Enterprise Designation was great in theory but in reality did not provide the intended amount of flexibility. He thought that the informal resentment of the bureaucrats circumvented because of the designation stifled the intent of the program. The program office felt pressure not to drop requirements and only used the authority provided by the designation on a limited basis. [Ref. 29]

## D. ACQUISITION STRATEGY STRENGTHS AND WEAKNESSES

### 1. ATACMS

#### *a. Strengths*

Analysis of the acquisition strategy of ATACMS reveals the following strengths:

- Effective use of tailoring
- Realism
- FPIF contract for EMD
- Flexibility

The strategy was tailored to fit the technology available. Based on the technology available, the acquisition process was able to be shortened significantly for ATACMS. ATACMS skipped two phases of the acquisition process beginning in Phase II, EMD. Time was not the only saving that can be attributed to the shortened acquisition process. The shortened process also saved millions of dollars based on the deletion of the acquisition phases. The strategy took a realistic approach, in that, the strategy allowed the contractor adequate time to successfully complete EMD and selected technology that was within the state-of-the-art. The technology selected also allowed the program office to use an FPIF contract for EMD which incentivized the contractor to complete the EMD contract on cost and schedule. Flexibility was achieved by the planning of two LRIP options and alternative production options into the strategy.

#### *b. Weaknesses*

Analysis of the acquisition strategy of ATACMS reveals the following weaknesses:

- Dual sourcing for critical components
- Use of ATACMS contract to do MLRS integration

ATACMS lost critical time when Singer, maker of the

CAS, defaulted. If another source for the CAS had been available, the problem of recertifying another contractor on short notice could have been avoided. The mixing of the MLRS integration into ATACMS strategy created conflicts of interest between the MLRS Program Office and the ATACMS Program Office, because both program offices were essentially working on the same thing. Since MLRS already had an established program office with experience and expertise on the MLRS, a better strategy might have been to make the MLRS Program Office solely responsible for the integration.

**2. Javelin**

***a. Strengths***

Examination of Javelin's acquisition strategy reveals the following strengths:

- Use of Dual Sourcing
- Flexibility
- Full and open competition during POP

Use of dual sourcing for critical components was Javelin's acquisition strategy's greatest strength. When problems arose with the development of the FPA it was the second source, Santa Barbara Research Center, who was the only one to successfully develop the FPA for the guidance system. If it were not for the second source, the program would have failed. The strategy proved to be flexible. This is indicated by the program office's ability to successfully overcome the problems encountered during EMD and to successfully complete EMD on the restructured schedule. Use of full and open competition during POP yielded a weapon system that could meet or exceed mission requirements. The fire-and-forget concept developed and selected in POP is state-of-the-art technology and will provide U.S. Forces with a distinct advantage once fielded.

*b. Weaknesses*

Analysis of Javelin's acquisition strategy reveals the following weaknesses:

- Realism
- Cost estimation and control methods

Javelin's acquisition strategy was very aggressive considering Javelin was a program of true invention. Insufficient time was scheduled for the completion of EMD. This resulted in an inability to meet the initially established EMD of 36 months. The required restructuring brought serious doubt upon the program and required the program manager to rejustify the program's existence. Cost estimation and control methods alone were ineffective in controlling costs. The cost overrun experienced in the Javelin Program was so large it jeopardized the existence of the program. Based on the high cost risk of a program of true invention, methods to correctly estimate and control program costs should have been paramount in the acquisition strategy.

## E. COMPARISON TO EVALUATION CRITERIA

Chapter II outlined certain aspects of an acquisition strategy that have proven to be beneficial in ensuring that an acquisition strategy can meet the program objectives. These criteria are realism, stability, balance, flexibility, and controlled risk and are defined in Chapter II. The results of the comparison of the acquisition strategies of each weapon system to the evaluation criteria are summarized in Table 3.

| Evaluation Criteria | ATACMS | Javelin |
|---|---|---|
| Realism | Yes | No |
| Stability | Yes | No |
| Balance | Yes | No |
| Flexibility | Yes | Yes |
| Controlled Risk | Yes | No |

**Table 3. Summary of Comparison**

The comparison indicates that the acquisition strategy criteria outlined in the Defense Systems Management College's "*Acquisition Strategy Guide*" are valid. ATACMS's acquisition strategy meets all of the established criteria and the ATACMS Program was very successful. ATACMS's success is indicated by the development of a quality weapon system on cost and schedule. Another indication of ATACM's success is the fact that the ATACMS Program Manager was named the Army's Program Manager of the Year in 1991. On the other hand, the Javelin Program's acquisition strategy does not meet the majority of the evaluation criteria and as discussed in this thesis the program encountered many problems as it was executed.

**1. ATACMS**

***a. Realism***

ATACMS's acquisition strategy's realism is evidenced in several areas of the program. The acquisition strategy allowed sufficient time for successful completion of EMD, 48 months, and used technology that was mature reducing overall program risk. Efforts were also made by the program office to ensure requirements outlined in the ROC were not inflated past proven technology.

***b. Stability***

ATACMS's acquisition strategy's stability is indicated by the program's ability to continue with minimal problem when a subcontractor making a critical component

defaulted. The negative influence of the default did not disrupt the operation of the program. The program office used the second LRIP option to elevate the problem. The strategy also called for the use of a multi-year contract for the production buy. The use of a multi-year contract is a long-term commitment to the contractor and thus adds stability to the program.

***c. Balance***

ATACMS's acquisition strategy proved to be balanced as indicated by the program's overall performance. ATACMS maintained the cost, schedule and performance objectives established at the onset of the program without fail.

***d. Flexibility***

ATACMS's acquisition strategy proved to be flexible. Just as the program office was preparing to field the first unit with ATACMS, DoD directed a change to the fielding plan in support of the Gulf War. The program office was able to successfully adapt to the changed fielding plan and to date all fieldings have been made on schedule. The strategy also included alternative production options. The alternative production options were developed in the event Congress failed to approve the preferred production option of a multi-year contract.

***e. Controlled Risk***

ATACMS's acquisition strategy successfully controlled the risk associated with the acquisition of the weapon system. This is illustrated by the program being completed on cost and schedule to date. Some methods used to mitigate risk were: the use of fixed-price type contracts that incentivized the contractor to maintain cost and schedule objectives, the use of hard-tooled prototypes that required the contractor to establish and maintain the production line early in the process and the use of early troop involvement in the developmental testing that reduced the number of changes required during the development process.

## 2. Javelin

### *a. Realism*

Javelin's acquisition strategy had some elements that lacked realism. The acquisition strategy used took an aggressive approach in the establishment of a 36-month EMD. The 36-month EMD proved to be unattainable and the program had to be rebaselined. Another area where the program lacked realism was the establishment of the weight requirement. Due to technical difficulties, the contractor was unable to meet the initially established weight requirement so the initial requirement had to be rebaselined to an achievable total system weight.

### *b. Stability*

The Javelin program experienced problems with stability due to the current DoD downsizing. The effect of the downsizing is a 40% reduction in the number of Javelin weapon systems required to meet the Army's needs. This reduction in the production requirement will probably cause an increase in the per unit price of the weapon system and increase schedule risk of the program.

### *c. Balance*

The program experienced problems with balance as the technical problems were occurring. The program office was so focused on the technical problems occurring during EMD that the eventual cost problem went unforeseen until it was out of control. The estimated cost to complete EMD more than doubled as the program progressed.

### *d. Flexibility*

The strategy proved to be flexible, in that, the program was able to continue in spite of the problems encountered. The program had both technical and cost problems, which caused the program to be restructured. The program office was able to successfully overcome the problems and EMD was successfully completed on the restructured schedule.

*e. Controlled Risk*

The program was unable to successfully control the risk associated with the program. This is indicated by the program's inability to successfully control the schedule and cost risk of the program. The program had a schedule slippage and cost overrun.

## F. SUMMARY OF LESSONS LEARNED

This section summarizes the principal lessons learned based on the review of acquisition policies and from the study of ATACMS and Javelin acquisition programs.

### 1. Maturity of Technology

The maturity level of the technology selected for use on the program should be a key consideration in the development of the acquisition strategy. The maturity of the technology affects many aspects of the acquisition strategy such as: how the program should be tailored, schedule length and contract types. One significant difference in ATACMS and Javelin Programs was the maturity of the technology chosen for use. ATACMS's strategy planned a longer EMD than did Javelin's strategy even though Javelin's technology was less mature. The result of Javelin's aggressive approach was failure to meet the planned schedule.

### 2. Realism

The acquisition strategy developed must be realistic. This seems to be an obvious point but this study and many others have shown that is not always the case. Program managers are faced with conflicting demands when developing an acquisition strategy, in that, they are suppose to develop and field the product as soon as possible, while minimizing the technical and cost risks associated with the program. In making compromise between these conflicting elements the program manager must ensure that cost estimates are valid and the planned schedule remains attainable. ATACMS did well in this area using mature technology, ensuring program baselines remained attainable and planning an achievable schedule. Some

areas of Javelin's strategy were unrealistic. The aggressive schedule undertaken by Javelin proved to be unachievable due to the occurrence of technical problems and an unattainable weight requirement.

**3. Tailoring**

Tailoring is an important element of an acquisition strategy. Both the ATACMS and Javelin programs successfully tailored their acquisition strategies. Examples of tailoring done by each program was the shortening of the acquisition process based on the previous studies that were conducted. In both programs the acquisition strategies were successfully tailored to fit the specific elements of each program.

**4. Dual Sourcing**

Dual sourcing is an effective method of risk reduction. However, before dual sourcing is planned, a cost/benefit analysis of the use of dual sourcing should be completed to ensure that the dual sourcing will be cost effective. Both ATACMS and Javelin were affected by dual sourcing. ATACMS encountered problems due to a lack of dual sourcing, when the sole maker of a critical component went out of business. Javelin was saved by the use of dual sourcing, when the second source for a critical component was the only one able to successfully develop the component.

**5. Flexibility**

Flexibility is an important quality of an acquisition strategy. Both ATACMS and Javelin's acquisition strategies planned flexibility into their strategy through the use of two LRIPs. The second LRIP was to be used if problems arose in testing or other areas. The second LRIP is important because it can be used to prevent a break in production. If a break in production occurs, the production line must be recertified and the contractor must deal with the problem of idle workers. The second LRIP planned in the ATACMS's acquisition strategy was used to prevent a schedule breach when Singer defaulted on the CAS. ATACMS entered the second LRIP to gain enough time

for another subcontractor to be recertified and prevented the schedule breach.

# V. CONCLUSIONS

## A. CONCLUSIONS

Although the acquisition strategy of a developmental weapon system acquisition program is very important to program success, it would be naive to think that a well-developed acquisition strategy by itself will lead to success. Many other factors are also required in order for a program to be successful. Examples of other important factors required for success include strong leadership, support from the Service and Congress and allocation of adequate resources. The combination of all of the factors listed above lead to the successful execution of the acquisition of a weapon system.

Realism is an important element in the development of an acquisition strategy. The Javelin Program's acquisition strategy is an example of how a lack of realism will only lead to future problems. Both cost and schedule estimates need to be realistic so that decision makers can make the correct decisions from the onset. The current goals of getting weapon systems to the field as fast and cheap as possible contribute to the problem of achieving realism. The idea of fast and cheap incentivizes the use of overly optimistic estimates, which lead to the development of unrealistic strategies. Somehow the incentive needs to be changed so that realism is incentivized more than over-optimism.

Methods of limiting technology risks for developmental weapon system acquisitions need to be explored. The maturity level of technology selected for use in the developmental weapon system acquisition process has many impacts on the program. These impacts are seen in the Javelin Program. Examples are schedule and cost overruns. There is an inherent level of high risk associated with the use of immature technology in the acquisition of a weapon

system. Some method to mitigate some of the risk before the start of the program would be beneficial.

## B. RESEARCH QUESTIONS

### 1. Primary Research Question

What are the similarities and differences in the acquisition strategies used for ATACMS and Javelin and what can Program Managers learn from the success or failures of the execution of these programs' acquisition strategies?

As pointed out in Chapter IV, Section B, ATACMS and Javelin have many similarities. However, the differences provided in Chapter IV, Section C indicate that there are some significant differences in the two programs' acquisition strategies. The most significant of these differences are the level of maturity of the technology selected for use, the length of EMD and the contract type selected for EMD.

### 2. Secondary Research Questions

a. What were the acquisition strategies used by each of the programs and were the strategies selected appropriate for these programs?

The acquisition strategies used by each of the programs are outlined in Chapter III, Sections B and C. The strategy selected for ATACMS was appropriate. This is indicated by the quality of the weapon system developed and the overall success of the program. Javelin's acquisition strategy was not appropriate based on the fact that the length of EMD planned did not match the maturity level of technology to be developed for the program. Javelin's EMD was restructured by adding additional time and was successfully completed on the restructured schedule.

b. To what extent did the programs follow the acquisition strategies established at the start of the programs?

ATACMS followed the strategy developed at the onset

except for the DoD directed fielding change in support of the Gulf War. Javelin was unable to follow the strategy developed at the onset of the program. Javelin was required to change the strategy based on the technical problems encountered in EMD. The changes included the addition of 18 months to EMD and a change to the planned production buy of the weapon system. The production buy was changed from competitive to sole source to the EMD contractor.

c. What were the strengths and weaknesses of each of the two acquisition strategies?

The strengths and weaknesses of each program's acquisition strategy are outlined in Chapter IV. ATACMS's acquisition strategy's most significant strength was the effective use of tailoring and its most detrimental weakness was the lack of dual sourcing for critical components. Javelin's acquisition strategy's most significant strength was the use of dual sourcing for critical components and its most detrimental weakness was the aggressive schedule planned for EMD.

d. What impact does the acquisition strategy of a program have on the program's success or failure?

The acquisition strategy of a developmental weapon system acquisition can have significant impact on the success or failure of the program as indicated by this study. However, a well developed acquisition strategy by itself will not always lead to success. Other factors also affect the success or failure of a program such as the quality of leadership, support provided and resources provided.

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