

# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



## THESIS

### ACQUISITION OF THREAT-REPRESENTATIVE BALLISTIC MISSILE TARGETS

by

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December 2002

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**ACQUISITION OF THREAT-REPRESENTATIVE BALLISTIC MISSILE  
TARGETS**

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Submitted in partial fulfillment of the  
requirements for the degree of

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## **ABSTRACT**

Test and Evaluation of ballistic missile defense systems under development is required to assess system technical performance, design specifications, and maturity, and to determine if the defense systems are operationally effective, suitable, and survivable against the threat(s) identified in the System Threat Assessment Report (STAR). Acquisition of threat-representative ballistic missile targets that emulate threat systems, as detailed in the STARS, are required to test and evaluate defense systems under realistic operational environments. The evolving ballistic missile threat and the increased proliferation of ballistic missile systems have increased the urgency to develop and field missile defense systems capable of defeating all of these threats. Threat-representative ballistic missile targets and Foreign Military Acquisition targets play a critical role in assessing performance capabilities, system maturity, operational effectiveness, suitability, and survivability during developmental and operational test and evaluation of missile defense systems. This research identifies key management challenges experienced since 1990 by current and former target Product Managers and Project Managers. Recommendations are also included concerning how to manage these challenges based upon the lessons learned provided by experienced Product Managers and Project Managers.

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# **I. INTRODUCTION**

## **A. PREFACE**

United States' missile defense systems are designed to defend against short, medium, and long range ballistic missile threats. Evolving ballistic missile threats and the increased proliferation of ballistic missile systems have increased the urgency to develop and field missile defense systems capable of defeating all of these threats. Threat-representative ballistic missile targets and Foreign Military Acquisition targets play a critical role in assessing missile defense system performance and operational capabilities. This research will explore and identify key management problems experienced by current and former ballistic missile target Product Managers and Project Managers. It will provide possible solutions and/or strategies based upon an analysis of these management problems. In addition, the research will identify how changes resulting from the realignment of the Ballistic Missile Defense Organization (BMDO) and being re-designated as the Missile Defense Agency (MDA), will impact the ballistic missile target acquisition activity.

## **B. BACKGROUND**

Test and evaluation of missile defense systems under development is required to assess system technical performance, design specifications, and maturity, and to determine if the defense systems are operationally effective, suitable, and survivable against the threat(s) identified in the System Threat Assessment Report (STAR). Acquisition of threat-representative ballistic missile targets that emulate threat systems, as detailed in the STARS, are required to test and evaluate defense systems under realistic operational environments. The evolving ballistic missile threat and the increased proliferation of ballistic missile systems have increased the urgency to develop and field missile defense systems capable of defeating all of these threats. Threat-representative ballistic missile targets and Foreign Military Acquisition targets play a critical role in assessing performance capabilities, system maturity, operational effectiveness, suitability, and survivability during developmental and operational test and evaluation of missile defense systems. Managing cost, schedule, and performance challenges in the development of ballistic missile targets is crucial to the success of the targets program

and the ballistic missile defense elements that require these targets to assess system performance. Research and documentation of the ballistic missile target acquisition process and how management interacts with each step of the process will set the framework from which the identified management problems will be analyzed. The proposed research will provide possible solutions and/or strategies based upon an analysis of the most significant management problems experienced by current and former target Product Managers and Project Managers. In addition, the research will identify how changes resulting from the realignment of the Ballistic Missile Defense Organization and re-designation as the Missile Defense Agency, will affect ballistic missile target acquisition activity.

#### **C. RESEARCH QUESTIONS**

##### **1. Primary Research Question**

- What are some possible solutions and/or strategies to address the most significant management problems experienced by ballistic missile target Product Managers and Project Managers?

##### **2. Secondary Research Questions**

- What are the policies and regulations that require acquisition of ballistic missile targets for defense system test and evaluation?
- How are missile defense system ballistic missile target requirements defined?
- How are ballistic missile target requirements translated into target systems that meet defense system requirements?
- What contract types and contract structures are used in the acquisition of ballistic missile targets?
- What are the products and services provided by the Missile Defense Targets Joint Project Office formerly the Ballistic Missile Targets Joint Project Office?
- What are the most significant management problems experienced by ballistic missile target Product Managers and Project Managers?
- How will recent changes resulting from the realignment of the Ballistic Missile Defense Organization and re-designation as the Missile Defense Agency, affect the ballistic missile target acquisition activity?

#### **D. SCOPE AND LIMITATIONS**

This research will address the most significant management problems experienced by Ballistic Missile Target Product Managers since 1990. The thesis will include: (1) a

review of Department of Defense policies, regulations, Missile Defense Targets Joint Project Office documentation, and open literature; (2) an analysis of most significant management problems experienced by current and former target Product and Targets Office Project Managers; and (3) an analysis of changes to the ballistic missile target acquisition process resulting from the realignment of the Ballistic Missile Defense Organization and re-designation as the Missile Defense Agency.

## **E. METHODOLOGY**

### **1. Data Collection**

The information about key management problems experienced by current and former ballistic missile target Product Managers and Project Managers was obtained through the administration of a questionnaire.

### **2. Data Analysis**

A through literature review of sources include, but are not limited to, the following:

- Department of Defense Policy and Regulations
- General Accounting Office Reports
- Unclassified Department of Defense Publications
- Published academic research papers
- References, publications, and electronic media (e.g., Center for Defense Information, Institute for National Strategic Studies, Defense Information System Network, etc.)
- Internet websites and homepages (Department of Defense, commercial, and academic)
- Interviews with Government and contractor personnel (in person and over the telephone)
- Questionnaire sent to current and former Product Managers and Project Managers

## **F. THESIS ORGANIZATION**

This thesis contains five chapters.

Chapter I provides an introduction to the subject of the acquisition of threat-representative ballistic missile targets and the basis for the case study, outlining the scope and limitations, the methodology, and the organization of the thesis.

Chapter II provides the background and foundation from which the management problems will be addressed.

Chapter III presents a description of the ballistic missile target acquisition process and provides information about the key management problems experienced by current and former ballistic missile target Product Managers and Project Managers. Changes to the ballistic missile target acquisition process resulting from modifications to the ballistic missile defense system are also included.

Chapter IV provides an analysis of the data collected and provides possible solutions and/or strategies to address the key management problems identified by the questionnaire responses.

Chapter V provides conclusions and recommendations, and identifies areas for further research.

#### **G. BENEFITS OF RESEARCH**

Current and future Missile Defense Targets Joint Project Office managers, employees, and ballistic missile defense elements that require ballistic missile targets for test and evaluation of their system(s) can benefit from the analysis of the management-related problems, information about the organizations, roles and responsibilities, key players, products, services, and processes documented in this study.

## **II. BACKGROUND**

### **A. INTRODUCTION**

The test and evaluation of developmental ballistic missile defense systems that are being designed to defeat ballistic missile target threats is required to assess system technical performance, design specifications, and maturity, and to determine if the defense systems are operationally effective, suitable, and survivable against the threat(s) identified in the System Threat Assessment Report (STAR). This chapter provides some background information on how the requirement for the acquisition of threat-representative ballistic missile targets was established. In January 1984, Presidential National Security Division Directive 119 established the Strategic Defense Initiative (SDI). The purpose of the SDI was “to explore the possibility of developing missile defenses as an alternative means of deterring nuclear war.” [Ref. 1] The primary emphasis of the SDI program was to be on non-nuclear developments. Secretary of Defense Casper Weinberger signed the charter for the Strategic Defense Initiative Organization (SDIO) in April 1984. In July 1986, the Director of SDIO ordered that SDIO be reorganized to include two principal deputies: a Deputy for Programs and Systems and a Deputy for Technology. This change in the SDIO organization was in response to the increased importance assigned to the system/architectural designs and was an indication that SDIO was working through the technical issues it faced when the program began. In January 1988, Senator Nunn (D-GA) delivered a speech to the Arms Control Association that called for a new SDI program to focus on developing a “limited system for protecting against accidental and unauthorized launches” with a long range goal of developing a more comprehensive defense system. This led to another realignment of the SDIO in late September 1988. In October 1990, the Fiscal Year 1991 Appropriations Conference Committee Report, H. Rep. 101 -938, called for the Secretary of Defense to establish a centrally-managed Theater Missile Defense (TMD) Program. The conference committee report also required the Defense Department to accelerate research and development on theater and tactical ballistic missile defense systems. The responsibility for the centrally-managed TMD program was assigned to the SDIO. The Missile Defense Act of 1991 was amended in October of 1992, by the National Defense

Authorization Act for Fiscal Year 1993, and placed more emphasis on treaty compliance in any new National Missile Defense (NMD) the United States might choose to deploy. In May 1993, Secretary of Defense Les Aspin announced that the SDIO was being redesignated the Ballistic Missile Defense Organization (BMDO) to reflect the new focus on the Department of Defense's missile defense program. The results of the Clinton Administration's Bottoms-Up-Review were announced in September 1993, which laid out America's national security plans for the five-year period between FY95 and FY99, with primary emphasis placed upon TMD, followed by NMD and Follow-on Technology, Research, and Support. [Ref. 1]

Policy established by the Ballistic Missile Defense Act of 1995 required (1) the deployment at the earliest practical date of a highly effective theater missile defenses (TMDs) to protect forward-deployed and expeditionary elements of the Armed Forces of the United States (U.S.) and to complement and support the missile defense capabilities of friendly forces and allies of the U.S.; and (2) the deployment at the earliest practical date of a national missile defense (NMD) system capable of providing a highly effective defense of the United States against limited ballistic missile attacks. [Ref. 2]

The BMDO, under the authority, direction, and control of the Under Secretary of Defense (Acquisition and Technology), is responsible for managing and directing the DoD's Ballistic Missile Defense programs. The BMDO is also responsible for the research and development of follow-on technologies that are relevant for long-term ballistic missile defense. The programs build a technical foundation for the evolutionary growth for future ballistic missile defenses. In developing these acquisition and technology programs, the BMDO utilizes the services of the Military Departments, the Department of Energy, private industry, and educational and research institutions. [Ref. 3]

Title 10, United States Code, and Department of Defense Directive (DoDD) 5000.1, require in-depth test and evaluation (T&E) as early as possible in the system acquisition process in order to reduce acquisition risk and to predict the capability of the system to meet technical and operational requirements. [Ref. 4] The BMDO Consolidated Targets Program (CTP) provides threat-representative targets for testing all ballistic missile defense system elements. As such, the test and evaluation program is designed to assess technology, reduce acquisition risk, verify attainment of technical

performance objectives, and to ensure systems are operationally effective and suitable. Data and information resulting from T&E must be analyzed and reported in a timely manner to support the decision-making process. The BMDO also serves as the interface with both the U. S. Congress and the Office of the Secretary of Defense (OSD) Test and Evaluation offices for all target-related matters.

The Department of Defense (DoD) designated the BMDO as the organization responsible for the acquisition of ballistic missile defense targets. The BMDO established the CTP to execute all of the activities necessary to acquire ballistic missile targets with the goal of providing cost-effective and threat-representative targets as required for Ballistic Missile Defense System (BMDS) applications.

## **B. POLICIES AND REGULATIONS THAT REQUIRE ACQUISITION OF BALLISTIC MISSILE TARGETS**

United States missile defense systems are designed to defend against short, medium, and long range ballistic missile threats. Evolving ballistic missile threats and the increased proliferation of ballistic missile systems have increased the urgency to develop and field missile defense systems capable of defeating all of these threats. Threat-representative ballistic missile targets and Foreign Military Acquisition targets play a critical role in assessing performance capabilities, system maturity, and operational effectiveness, suitability, and survivability during the developmental and operational test and evaluation of missile defense systems. Key policies that direct the DoD to procure, to develop, and field ballistic missile defense systems are discussed below.

### **1. DoD Directive 5134.9, “Ballistic Missile Defense Organization,” June 14, 1994**

The DoD Directive 5134.9 requires that the Director of BMDO organize, direct, manage BMDO and all assigned resources and activities. In addition, the Director of BMDO shall provide for the procurement and fielding of assigned systems and administer and supervise all programs, services, and items under the BMD Program to include, but not limited to: (1) theater missile defense systems; (2) the U.S. ballistic missile defense system; (3) other antiballistic missile systems or upgrades as may be assigned by the Under Secretary of Defense (Acquisition and Technology).

**2. DoD Directive 5000.1, “The Defense Acquisition System,” October 23, 2000**

4.1.2. The Defense Acquisition System shall emphasize acquisition judgment based on consideration of a relevant family-of-systems, including those that cross Component organizational boundaries. To that end, the requirements community shall specify key performance parameters and the acquisition and test and evaluation communities shall adopt a family-of-systems management approach to ensure that their reviews of individual systems include a thorough understanding of critical system interfaces related to the system under review and the flow of consistent and reliable data, information, and services among systems in the battlefield. The objective is an environment characterized by mutual understanding of key systems in a given mission area; shared decision-making and close cooperation between the requirements, test and evaluation, and acquisition communities; and disciplined control over the development and introduction of acceptable interoperable systems.

4.3.2. Integrated Test and Evaluation. Test and evaluation is the principal tool with which progress in system development is measured. The complexity of modern weapon systems demands that test and evaluation programs be integrated throughout the defense acquisition process. Test and evaluation shall be structured to support the defense acquisition process and the user by providing essential information to decision-makers, assessing attainment of technical performance parameters, and determining whether systems are operationally effective, suitable, and survivable for intended use. Test and evaluation is conducted to facilitate learning, assess technical maturity and interoperability, facilitate integration into fielded forces, and confirm performance. Test and evaluation shall be closely integrated with requirements definition, threat projections, systems design and development, and shall support the user through assessments of a system's contributions to mission capabilities. Test and evaluation planning shall begin early in the acquisition process. To the greatest extent possible, the DoD Components shall gather test data to identify the total cost of ownership, and at a minimum, the major drivers of life-cycle costs. Each Military Department shall establish an independent operational test and evaluation agency, reporting directly to the Service Chief, to plan and conduct operational tests, report results, and provide evaluations of effectiveness and suitability.

**3. DoD Directive 5000.2-R, “Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System Acquisition Programs (MAISAPS),” April 5, 2002**

The PM is required to prepare an acquisition strategy that includes a summary diagram of how the relationships among acquisition phases, work efforts, decision points, solicitations, contract awards, systems engineering design reviews, contract deliveries,



T&E activities, production lots, and operational deployment objectives interact. The T&E strategy shall provide information about risk and risk mitigation, provide empirical data to validate models and simulations, evaluate technical performance and system maturity, and determine whether systems are operationally effective, suitable, and survivable against the threat detailed in the STAR. The TEMP shall contain test event or scenario descriptions and resource requirements, including special instrumentation, test articles, ranges and facilities, and threat targets and simulations, validated in accordance with an approved process by the Director, Operational Test and Evaluation and test limitations that impact the system evaluation. Operational T&E shall use threat or threat-representative forces, targets, and threat countermeasures, validated by DIA or the DoD Component intelligence agency, as appropriate, and approved by the Director, Operational Test and Evaluation. It shall also identify critical system characteristics or unique support concepts resulting in special test and analysis requirements, test targets, and expendables.

### **C. EVOLVING BALLISTIC MISSILE THREAT**

While the end of the Cold War signaled a reduction in the likelihood of global conflict, the threat from foreign missiles has grown steadily as sophisticated missile technology becomes available on a wider scale. The proliferation of weapons of mass destruction, and the ballistic and cruise missiles that could deliver them pose a direct and immediate threat to the security of U.S. military forces and assets in overseas theaters of operation, our allies and friends, as well as our own country. We have already witnessed the willingness of countries to use theater-class ballistic missiles for military purposes. Since 1980, ballistic missiles have been used in six regional conflicts. Strategic ballistic missiles, including intercontinental and submarine-launched ballistic missiles (ICBMs and SLBMs) exist in abundance in the world today. [Ref. 5]

The evolving ballistic missile threat and the increased proliferation of ballistic missile systems have increased the urgency to develop and field missile defense systems capable of defeating all of these threats. Acquisition of threat-representative ballistic missile targets that emulate threat systems as detailed in the System Threat Assessment Reports (STAR) are required to test and evaluate defense systems under stressing conditions in realistic operational environments. Threat-representative ballistic missile targets and Foreign Military Acquisition targets play a critical role in assessing performance capabilities, system maturity, and operational effectiveness, suitability, and

survivability during developmental and operational test and evaluation of ballistic missile defense systems designed to defeat these threats on the battlefield.

The threat from ballistic missiles armed with conventional (high-explosive) or non-conventional warheads (nuclear, biological, or chemical), continues to increase based upon the availability of missile technology. Over 25 countries have ballistic missile systems. [Ref. 6] Ballistic missiles can be grouped into categories based upon their maximum range potential, which include the short-range ballistic missile (< 1000 kilometers (km)), the medium-range ballistic missile (1,000 – 3,000 km), the intermediate-range ballistic missile (3,000 – 5,500 km), and the long-range ballistic missile (> 5,500 km). Submarine-launched ballistic missiles are also included, regardless of their maximum range capability. [Ref. 7] The range of theater ballistic missiles was defined as 80 to 3,000 km in a report to Congress in 1994. The Theater Missile Defense Family of Systems concept was designed to detect, classify, intercept, and destroy ballistic missiles with range capabilities of up to 3000 km. [Ref. 8] Today, the Missile Defense Agency's BMD System Layered Defense concept will be capable of engaging all classes of ballistic missile threats. The program will increase system robustness by incrementally deploying layered defenses that use complimentary interceptors, sensors and battle management, and command and control systems to provide multiple engagement opportunities against threat targets in the boost, mid-course, and terminal phases of flight. [Ref. 9]

#### **D. DEPARTMENT OF DEFENSE BALLISTIC MISSILE DEFENSE ORGANIZATION CONSOLIDATED TARGETS PROGRAM (CTP)**

In December 1993, the Ballistic Missile Defense Organization (BMDO) approved a Consolidated Targets Program Plan (CTPP). It provided DoD users of ballistic missile targets with test articles for experiments, tests and training. The CTPP was revised in 1994 to update the processes and procedures, documentation, organizational responsibilities, and necessary lead-times for the acquisition, accreditation, and use of ballistic missile targets.

The BMDO Consolidated Targets Program (CTP) provides the threat-representative targets and services needed to support T&E activities of Theater Missile Defense (TMD), National Missile Defense (NMD), and other Department of Defense

(DoD) technology and demonstration programs. The CTP was instituted to centralize planning, management, acquisition, and operations for all BMDO target systems. The U.S. Army Space and Missile Defense Command (USASMDC), formerly the U.S. Army Space and Strategic Defense Command, had served as the primary executing agent since the inception of the CTP in 1993. The CTP approach has facilitated improved management of target requirements, validation, verification, and accreditation (VV&A) processes, and the acquisition and development of credible and cost-effective targets. The user develops and provides target requirements to the CTP executing agent based upon their test objectives. The targets program executing agent, in coordination with the user, analyzes, refines, and costs the target requirements to ensure that the user receives the most cost-effective targets that meet the test requirements. The targets program acquisition strategy emphasizes the use of off-the-shelf and excess Government equipment in order to reduce development and focus on target systems that allow maximum test flexibility with minimal infrastructure support. Foreign Military Acquisition (FMA) assets are also integrated whenever available and appropriate. [Ref. 10]

#### **1. Executing Agent**

The Missile Defense Targets Joint Project Office (MDTJPO), formerly the Ballistic Missile Targets Joint Project Office (BMTJPO), serves as the executing agent for the Department of Defense's BMDO Consolidated Targets Program. The BMTJPO was created when the U.S. Army Space and Missile Defense Command (SMDC) was established on 1 October 1997. The Army Acquisition Executive officially chartered the BMTJPO in June of 1998. Prior to October 1997, ballistic missile targets were provided by the Targets Division of the Test and Evaluation Office since the mid 1980s and by the Targets, Test, and Evaluation Directorate, beginning in 1993. Over a period of about 20 years, the MDTJPO has gone through several organizational and name changes and reorganizations. The most recent change in November 2001, re-designated the name of the organization from the Ballistic Missile Targets Joint Project Office to the Missile Defense Targets Joint Project Office reporting directly to the Missile Defense Agency, Director, Targets and Countermeasures. Previously, the Project Manager for the BMTJPO reported through the Director of the Acquisition Center and the Deputy

Commanding General of SMDC. The MDTJPO manages the ballistic missile target programs for the U.S. Army Space and Missile Defense Command, in Huntsville, Alabama. The MDTJPO works with all users to define ballistic missile target requirements, perform trade-off analysis and mission planning, identify hardware configurations, develop the acquisition strategy, and provide the technical direction and management required to implement the targets program in accordance with both the targets policy and management structure defined by the MDA. The MDTJPO provides ballistic missile target expertise and target program management, target development, acquisition, testing, and launch services, for the U.S. Army, Air Force, Navy, and Marine Corps. [Ref. 11]

*a. Organization*

The MDTJPO is led by a centrally-selected Army Acquisition Corps (AAC) Colonel who serves as Project Manager and reports directly to the Missile Defense Agency, Director, Targets and Countermeasures. The Project Manager also serves as the Deputy Director, Targets and Countermeasures. The MDTJPO is organized by product line, the short/medium-range targets product office, and the long-range targets product office. The organization includes two product offices, two divisions, and a management and strategic support office as shown in Figure 1. The Product Managers for the Short/Medium-Range Product Office and the Long-Range Product Office are centrally-selected Lieutenant Colonels, and the Product Development and Project Support Divisions are headed by GS-15 civilians. The Office of Management and Strategic support functions as part of the Project Manager's special staff in providing strategic planning, performance improvement, and professional development support. In September of 2001, the MDTJPO was staffed by five Army officers, 17 'core' Department of the Army (DA) civilians, and 35 'matrix' DA civilians. Approximately 63 percent of the matrix personnel are engineers and the remaining 37 percent are logistics, administration, or finance and accounting professionals. [Ref. 12] The MDTJPO was reorganized early in calendar year 2002. The results of this reorganization will be discussed further in Chapter IV.

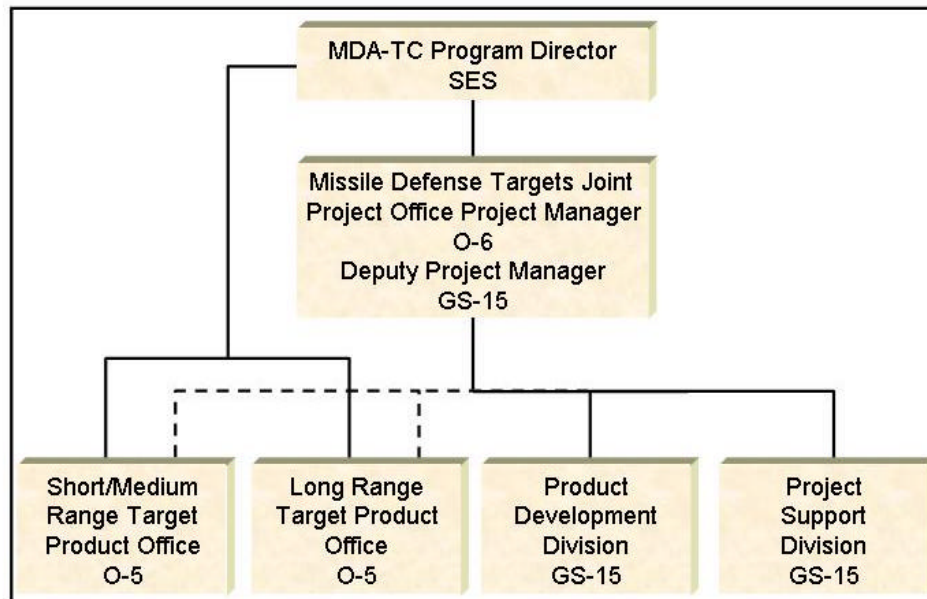


Figure 1. Missile Defense Targets Joint Project Office in Huntsville, AL.

The Long-Range Targets Product Office (LRTPO), formerly the Strategic Targets Product Office, is the executing agent for design, development, and acquisition of National Missile Defense target systems. Target systems developed and managed by the LRTPO Support Ground-Based Midcourse Defense (GMD), the Ground-Based Radar, and the Space-Based Infrared Sensor. The GMD target requirements are supported by the Orbital/Sub-Orbital Program (OSP) Target Launch Vehicle target system, which replaced the Minuteman II-based Multiple Service Launch System. This three-stage ICBM-class target payload deployment system is used to support the Ground-Based Interceptor. The Strategic Target System, or STARS, supports several defense programs, and provides the capability for delivery of a variety of threat-representative payloads to ranges, varying from 500 to 3,500 km. The LRTPO organization is organized as shown in Figure 2.

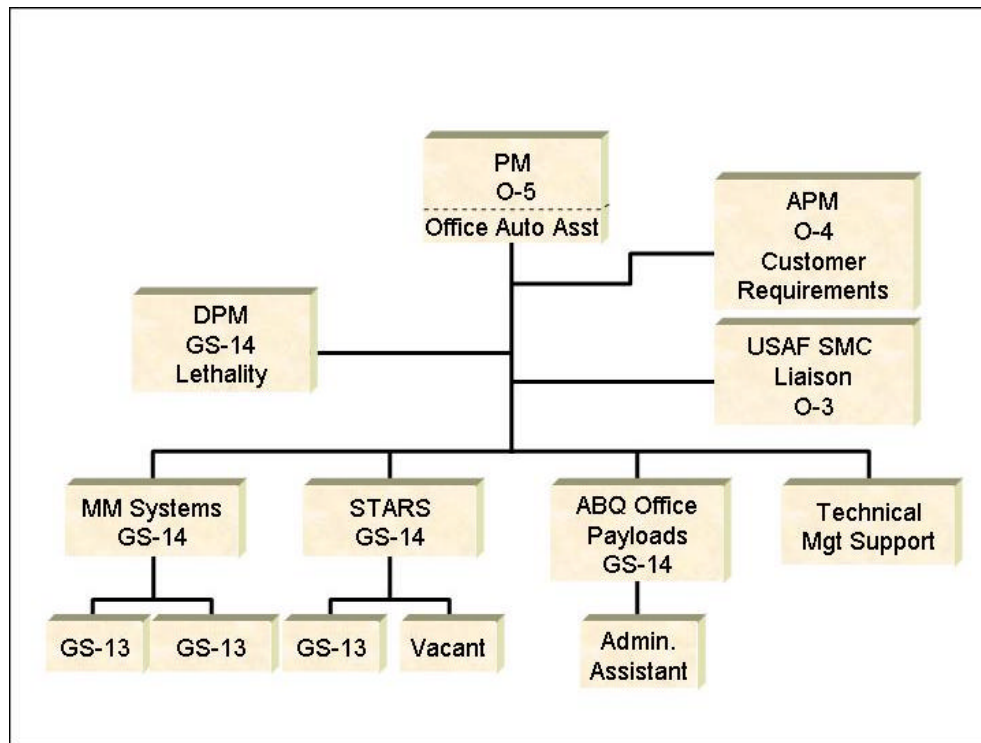


Figure 2. Long-Range Targets Product Office Organization.

The Short/Medium-Range Targets Product Office (S/MRTPO), formerly the Theater Targets Product Office, is the executing agent for the U.S. Army, Navy, and Air Force program target systems. The S/MRTPO provides target support to the Theater High Altitude Area Defense (THAAD), PATRIOT Advanced Capability 3 (PAC -3), PATRIOT, Medium Extended Air Defense System, Aegis Ballistic Missile Defense System, and the U.S. Air Force Airborne Laser programs. The current target suite includes the Hera, Storm II, Short-Range Air-Launched Target, Long-Range Air-Launched Target (Joint Program in development), and the Lance target systems. These target systems can deliver ballistic or maneuvering reentry vehicles with various payloads. The S/MRTPO organization is organized such that each of the BMDS elements is assigned a targets lead as shown in Figure 3. The Systems Engineering team supports all the BMDS elements in transitioning their ballistic missile target requirements into target systems that meet test objectives.

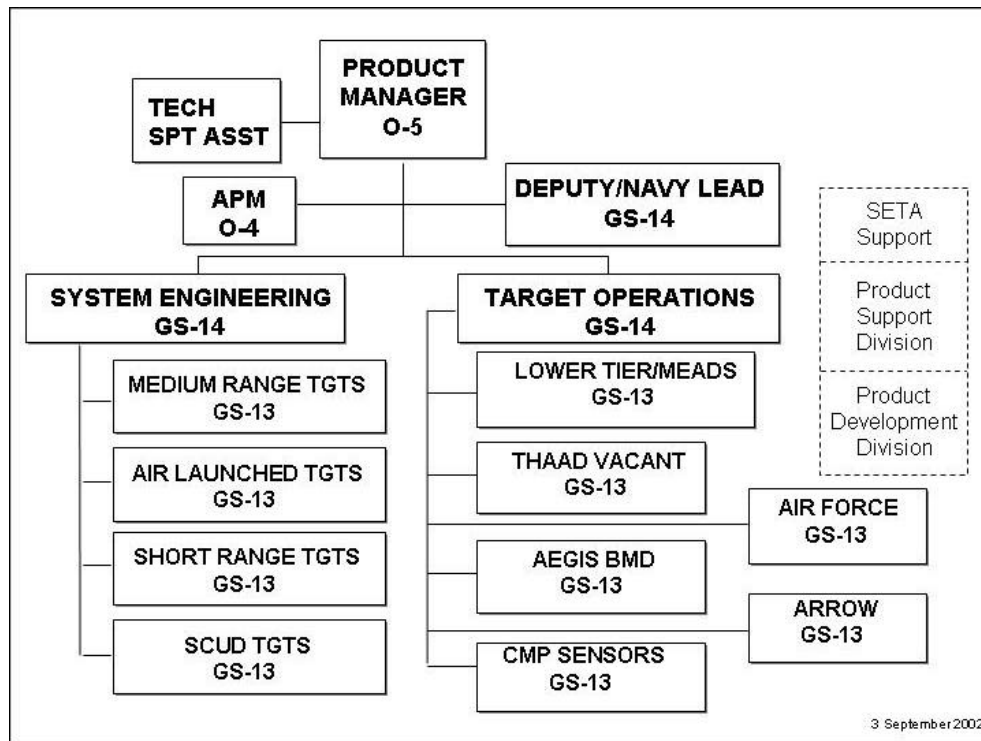


Figure 3. Short/Medium-Range Targets Product Office Organization.

***b. Responsibilities***

The MDTJPO provides short, medium, and long-range threat-representative ballistic missile target systems for the U.S. Army, Air Force, Navy, and Marine Corps. The MDTJPO manages the design, development, acquisition, and launch services for low, medium and high-fidelity targets, as required for test and evaluation of ballistic missile defense system elements. The MDTJPO provides ballistic missile target expertise, target program management, and complete test support of the ballistic missile target systems including test range coordination, site facilities, booster and payload integration, ground and launch equipment, and post-flight data analyses. Each ballistic missile targets system can be tailored and/or reconfigured to meet unique mission requirements. Early planning will document the required number of test articles, special range instrumentation, surrogates of threat weapons (targets), and target instrumentation needed to execute the test program. Ballistic missile targets used for operational test and

evaluation must be threat-representative or threat-derived and tested in a test environment that is as operationally realistic as possible. [Ref. 13]

All threat-representative ballistic missile targets used for the testing of ballistic missile defense system elements are developed in accordance with well-defined targets verification, validation, and accreditation (VV&A) processes. The VV&A process as shown in Figure 4 includes: (1) target verification, which is used to ensure that ballistic missile target designs are consistent with Defense Intelligence Agency (DIA) threat descriptions and user test requirements; (2) target validation, which is used to ensure that the ballistic missile targets accurately and represents the real-world threat based upon DIA threat descriptions within specified tolerances for a given set of comparison parameters; and (3) target accreditation, which involves the review and determination by the cognizant test authority that a given ballistic missile target has met established standards of verification and validation, is acceptable for its designated purpose, and meets intended test requirements.

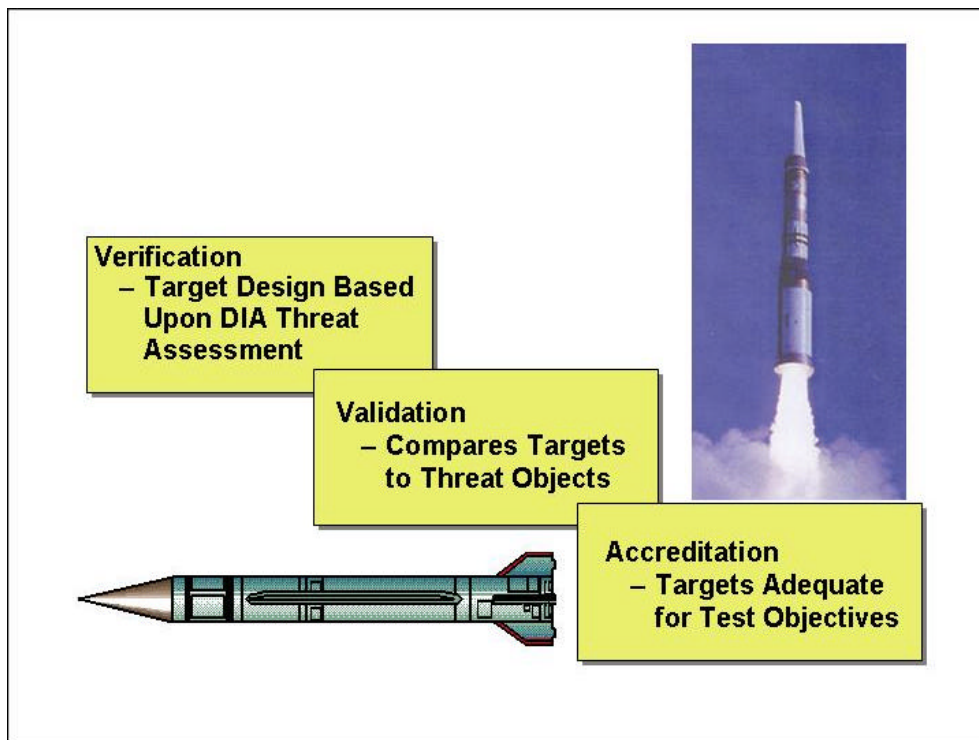


Figure 4. Verification, Validation, and Accreditation Process.



***c. Key Customers***

The MDTJPO customers are segmented by the short/medium-range targets and long-range targets product lines. All customers, regardless of product line, require on-time delivery of cost-effective targets that accurately emulate a variety of threat systems and scenarios. Test objectives and ballistic missile target performance requirements vary significantly between MDTJPO customers and from mission-to-mission. The MDTJPO is unique from most other Government agencies in that they rely upon their customers for funding. The list of customers for the MDTJPO includes the MDA as the primary customer, the Military Departments (U.S. Army, Air Force, Navy, and Marine Corps), and International customers (Israel and the United Kingdom). To ensure customer satisfaction, the MDTJPO has adopted the Army Performance Improvement Criteria as a management framework to systematically assess and improve their products, processes, and services. The MDTJPO builds customer relationships in several ways: (1) close contact is maintained with their customers through daily dialogue, teleconferences, meetings, reviews, and participation in working groups and/or integrated product teams, which helps the MDTJPO identify emerging issues and enhances their ability to respond quickly; (2) customers are invited to serve on source selection boards and participate in technical reviews to ensure a given ballistic missile target system will meet the customers needs; and (3) maintains customer focus and reinforces MDTJPO commitment with the direct involvement of senior leadership. [Ref. 14]

***d. Products and Services***

The key products and services provided by the MDTJPO are threat-representative ballistic missile target systems, target expertise, and target program management (design, development, and acquisition of ballistic missile target systems) and launch services (test support of the ballistic missile target systems) including test range coordination, site facilities, booster and payload integration, ground and launch equipment, and post flight data analyses.

**2. Categories of Ballistic Missile Targets**

***a. Low-Fidelity***

Low-fidelity targets are used for data collection, experimentation, or training flights during the early development phase of a missile defense program (i.e.,

concept exploration and definition and/or early in the demonstration and validation phase). The Lance Target Missile is an example of a low-fidelity target. See Figure 5. The Lance is a reliable, “low-cost” missile system, operable in any climatic condition. The Lance is a deactivated U.S. Army battlefield artillery missile system that was originally designed to carry a nuclear or high-energy explosive warhead to a range of approximately 130 km. Declared obsolete in April 1994, the Lance was converted for use as a short-range ballistic missile target, capable of being instrumented and modified to meet a wide-range of DoD test requirements. [Ref. 15] The missile incorporates a single stage, prepackaged, liquid-propellant propulsion system using unsymmetrical dimethylhydrazine (UDMH) as fuel and inhibited red fuming nitric acid (IRFNA) as an oxidizer. The engine is a dual-thrust chamber design in which both chambers operate initially for about a second followed by single chamber operation to sustain flight in the atmosphere. During the boost phase, two nozzles fed by gas from a solid propellant gas generator provide spin-up. The spin is maintained by fixed tab settings on the missile fins to provide aerodynamic stability and to minimize the effects upon accuracy of any thrust misalignment.



Figure 5. Lance Missile Target.

The Theater Targets Product Office, now the Short/Medium-Range Targets Product Office, has provided Lance missiles for use as targets in support of the development of Marine Corps Tactical Ballistic Missile Defense and of the Navy's Standard Missile 2 (SM-2), Block IVA, Infrared Risk Reduction Flight Demonstration, test series. Four Lance missiles were fired in support of the Navy's Risk Reduction Flights in early FY96.

**b. Medium-Fidelity**

Medium-fidelity targets are used for data collection and/or tracking missions. An example of a medium-fidelity target is the Terrier Lynx target. See Figure 6. The Terrier Lynx consists of two Terrier MK-70 mod 1 (TX-664) motors configured as a target vehicle. It has been used previously as a sounding rocket for purposes of gathering upper atmospheric data. The overall length of the Terrier Lynx vehicle is 32.5 feet. The maximum diameter is about 18 inches, not including fins, and the total weight is approximately 4300 pounds **plus a payload**. The motors are an upgrade of the Terrier MK-12, with a higher solids load. The propellant is of the nitrocellulose/nitroglycerine family with added lead and aluminum compounds.

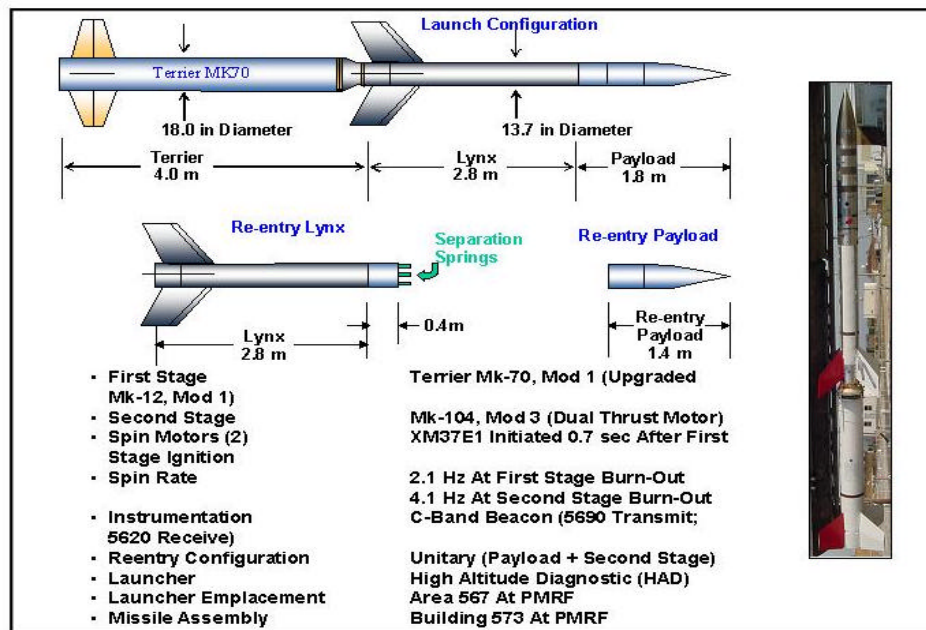


Figure 6. Terrier Lynx Target.

*c. High-Fidelity*

High-fidelity targets are used when ballistic missile defense system element interceptor test requirements call for threat-representative ballistic missile targets to meet test objectives as shown in Figure 7. A high-fidelity target will match threat performance (e.g., burn time, range, velocity, payload, etc), radar signature, and optical signature characteristics to the extent practicable. Hera is a theater ballistic missile target typically used for test and evaluation of BMDS element interceptor systems. The Hera Block IIB is a non-separating (unitary) configuration with a Modified Ballistic Reentry Vehicle 3 (MBRV-3) front end carrying a ballast payload. The Block IIB booster configuration incorporates four fins on the Piledriver Control Section (PCS) and four tails on the SR19 aft skirt. The Hera two-elevon actuation system is used for roll control during the first stage boost. The Unitary Guidance Control Section (UGCS) and Motor Adapter include an external heat shield. The UGCS includes a forward extension for interface with the MBRV-3. The MBRV-3 is a Foreign Military Asset (FMA) that includes an internal Photonic Hit Indicator (PHI) grid, hit detection system. The intercept body (target) is defined as the unitary upper stage (MBRV-3 with the UGCS, Motor Adapter, and M57A1 second stage attached). The Radar Cross Section (RCS) modifications, consisting of a conductive nose on the FMA, removal of the thrust termination port (TTP) tethers on the second stage, and a modified PCS flare incorporating a scattering ring, will be used to emulate the RCS signature characteristics of the defined threat. Motor Adapter and PCS ballast is used as required to achieve the desired flight profile.

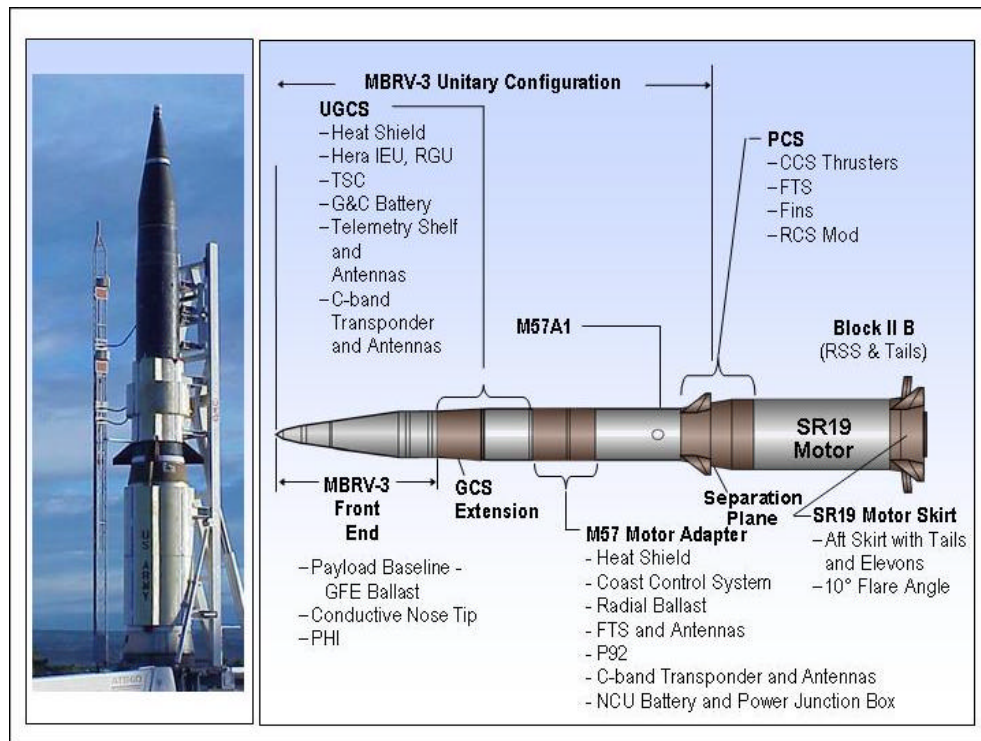


Figure 7. Hera MBRV-3 Target Configuration Summary.

## E. MISSILE DEFENSE SYSTEM BALLISTIC MISSILE TARGET REQUIREMENTS

Ballistic missile target requirements are defined by the BMDS elements in their Target System Requirements Document (TSRD) that is submitted to the MDA for approval. Although the evolution of a ballistic missile target system from the requirements generation, design, procurement, development, and fabrication to delivery at a test range parallels the development of a BMDS, the ballistic missile target system does not follow the same developmental process. The Mission Need Statement, Operational Requirements Document, and the Test and Evaluation Master Plan process is the means through which the target system requirements along with the BMDS requirements evolve into the requirements specified in the BMDS element TSRDs. A brief description of the requirements generation process and test and evaluation master plan for ballistic missile defense systems and ballistic missile target systems are included below.

## **1. Mission Need Statement**

The Requirements Generation System, the Acquisition Management System, and the Planning, Programming, and Budgeting System, form the Department of Defense's three principal decision support systems. Maintaining a balance among these systems is required to ensure that quality products are acquired for the nation's Armed Forces. The requirements generation system produces information for decision-makers on the projected mission needs of the warfighter. These mission needs are stated in terms of a non-system-specific operational need and defined in broad operational terms in a Mission Need Statement (MNS) document. Validation of the MNS by the validation authority is dependent upon potential ACAT level and/or if a program is designated Joint Requirements Oversight Council (JROC) special interest, confirms that a non-materiel solution alone cannot satisfy the identified need, and that a potential "new concept/system" materiel solution should be considered. The mission needs, based upon a Mission Area Analysis, may seek to establish a new operational capability, improve an existing capability, or exploit a technological opportunity to reduce costs or improve performance. The final step in the process includes the approval authority's concurrence in the final validated MNS document. Approval is a formal sanction that the validation process is complete and the identified need or operational capabilities described in the documentation are valid. Approval authority is dependent upon potential ACAT level, if designated JROC special interest, or if approval authority, has been delegated. Subsequently, the needs expressed in the MNS are developed into requirements by the Requirements Generation Process in the forms of a Capstone Requirements Document (CRD) (if required) and Operational Requirements Document (ORD). [Ref. 16] The Joint Staff and the Defense Intelligence Agency (DIA) also provide important review, coordination, and certification functions in support of the MNS validation and approval process. These functions include interoperability requirements certification, intelligence certification, threat validation, aviation munitions interoperability and munitions insensitivity certification, and the staffing of all documents that the JROC reviews.

According to Enclosure B of the CJCSI 3170.01B, Requirements Generation System, dated 15 April 2001, the requirements generation process will be uniform throughout the DoD. Specifically, the generation of requirements will consist of four

distinct phases: (1) definition; (2) documentation; (3) validation; and (4) approval. As a system evolves from an MNS to a CRD (if applicable) and into ORDs, there are differences in what is accomplished in each phase. The DoD Instruction 5000.2, Operation of the Defense Acquisition System, 23 October 2000, section 4.7.2, contains guidance that will be adhered to when developing and refining requirements documents.

## **2. Operational Requirements Document**

The Operational Requirements Document (ORD) specifies operational performance requirements, defines characteristics and capabilities, thresholds and objectives, and the critical performance parameters (KPPs) for a proposed concept or system. The ORD sponsor, in coordination with the appropriate DoD components, develops the ORD. The system proposed for continued evaluation in later acquisition phases will be described in an initial ORD in terms that define the system capabilities needed to satisfy the mission need. The requirements stated as operational performance parameters in the initial ORD, will be tailored to the system (e.g., satellite, aircraft, ship, missile, or weapon) and reflect system-level performance capabilities such as range, probability of kill, platform survivability, and the timing of the need, etc. The ORD provides the specific requirements base for the Acquisition Management System and the Planning, Programming, and Budgeting System (PPBS) for Advanced Defense Acquisition Program development, programming, and budgeting. See Figure 8. In addition, as DoD moves to the reduce cycle times of traditional acquisition activities through evolutionary acquisition, the ORD will serve as the vehicle for documenting successive operational requirements and managing the scope of that acquisition process.

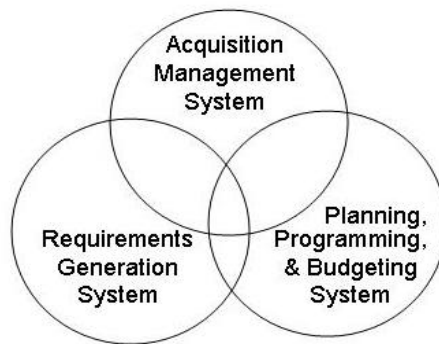


Figure 8. DoD Decision-Making Support Systems.

The ORD should also identify the factors that drive the timing of the requirements, such as retirement of existing systems or expected timing of an emerging threat. The ORD provides a bridge that links the needs and capabilities identified in the MNS and CRD (if applicable) to the Acquisition Program Baseline (APB) and the contractual specifications for a program. The initial ORD should be written at the appropriate level to describe the system and is submitted at Milestone B (or Milestone I) with broad objectives and acceptable requirements. Time-phased requirements are the preferred approach and must be considered based upon the maturity of technologies and the relative costs and benefits of executing the program in blocks versus a single step. The initial ORD will be updated to reflect the results of analysis, experimentation, testing, technology insertion, Cost as an Independent Variable (CAIV), and cost - schedule-performance trades as a program matures. If the program falls under a CRD, the ORD will show linkage and the contribution to the appropriate CRD operational requirements and CRD KPPs. The ORD will include a description of operational capability, threat, shortcomings of existing systems and Command, Control, Communications, Computers, Intelligence Surveillance and Reconnaissance (C4ISR) architectures, capabilities required for the system, program support, force structure, and schedule/program affordability for the system. [Ref. 17]

### **3. Test and Evaluation Master Plan**

Test and Evaluation (T&E) of missile defense systems under development is required to assess system technical performance, design specifications, and maturity, and to determine if the defense systems are operationally effective, suitable, and survivable against the threat(s) identified in the System Threat Assessment Report (STAR). The T&E process is an integral part of the systems engineering process and provides essential information in support of decision-making. Verification (i.e., T&E) confirms that Design Synthesis has resulted in a physical architecture that satisfies the system requirements. [Ref. 18] The DoD 5000.2-R, April 5, 2002, requires that the T&E strategy include information about risk and risk mitigation, provide empirical data to validate models and simulations, evaluate technical performance and system maturity, and determine whether systems are operationally effective, suitable, and survivable against the threat detailed in the STAR. The T&E strategy shall also address development and assessment of the



weapons test support systems during the System Development and Demonstration Phase, and into production, to ensure satisfactory test system measurement performance, calibration traceability and support, required diagnostics, safety, and correct test requirements implementation. Adequate time and resources shall be planned for all major test events to support pre-test predictions and post-test updates of the models based upon the test results. The T&E strategy planning usually begins during the Concept and Technology Development Phase in the form of a T&E Working Integrated Product Team (WIPT) formed by the Program Manager (PM). Representatives from DT&E (contractor and Government), OT&E, LFT&E, and intelligence communities are required to support the WIPT.

The T&E planning results in the Test and Evaluation Master Plan (TEMP) developed by the T&E WIPT and the PM in support of Milestones B and C. The TEMP focuses on the overall structure, major elements, and objectives of the T&E program and must be consistent with the acquisition strategy, approved ORD, and Command, Control, Communications, Computers, and Intelligence Support Plan. The TEMP provides a road map for integrated simulation, test, and evaluation plans, schedules, and resource requirements with sufficient detail to permit planning for the timely availability of the test resources necessary to accomplish the T&E program.

#### **4. Target System Requirements Document**

The Target System Requirements Document (TSRD) is a critical element in the targets development process that describes the functional target requirements for each target required by a user. These requirements are based on a number of factors including the type of system being tested, the degree of threat characteristics and performance representation needed, the scope of the testing (e.g., engineering development versus operational), schedule, and budget constraints. The cost of the ballistic missile target systems is driven by customer requirements as shown in Figure 9. Open dialog amongst all organizations involved is essential to develop and solidify the target requirements, which avoids potential future problems and cost impacts. The TSRDs should be submitted approximately three years in advance of the target need date. The TSRD must be approved by the MDA before the MDTJPO can develop a Target Support Plan, which serves as the targets program direction for execution by the MDTJPO. [Ref. 19]

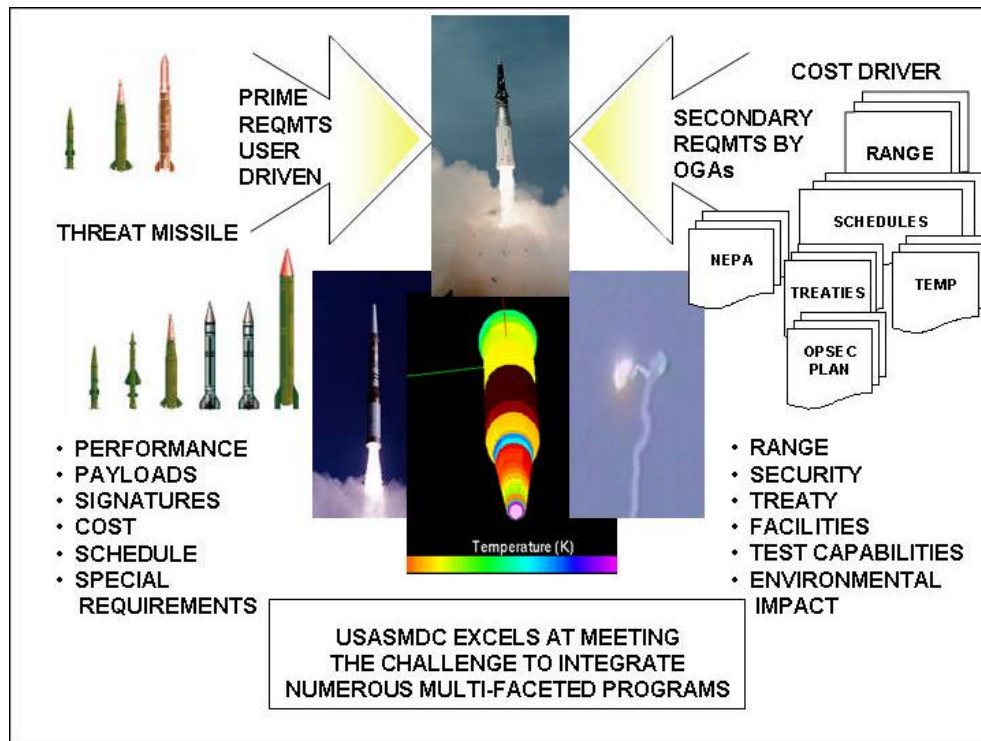


Figure 9. Target System Requirements Drive Cost.

## 5. Target Support Plan

The Target Support Plan (TSP) is developed and coordinated with appropriate agencies by the MDTJPO, typically 90 days after receipt of an approved TSRD. The TSP includes: (1) a top-level Requirements Compliance Matrix which highlights requirements that cannot be met (or can only be partially met) and an indication of the relative impact to mission objectives, program cost, and schedules; (2) provides an introduction to the targets support program and a detailed description of the target and delivery vehicle systems; (3) provides an item-by-item assessment of the capability to meet the requirements specified in the corresponding sections of the TSRD; and (4) identifies other requirements not specified in the TSRD (i.e., constraints imposed by treaties, environmental and safety policies, funding and test range limitations), which must be considered as part of the overall support planning process. The TSP is then submitted to the MDA for approval, which is typically 30 days. The approved TSP becomes the baseline planning document for use in managing the target development and

the formal commitment of the targets support to be provided to a given user. The TSP is the controlling document for placing targets performance requirements support under management control. The TSP will be revised as necessary to reflect MDA-approved requirement changes in subsequent TSRD revisions. Following the flight test, the MDTJPO prepares a Target Performance Report that documents target performance as compared to the performance predicted by target models and simulations. [Ref. 20]

#### **F. CONTRACTING METHODS AND CONTRACT TYPE**

The contract in place in late 2002 for the S/MRTPO is the Consolidated Theater Targets Services (CTTS) indefinite delivery - indefinite quantity, task ordering, cost plus incentive-award fee contract type. The CTTS contract was awarded in February 1998, to three contractors to provide ballistic targets in support of the BMDO CTP. The period of performance for the contract was five years, with a priced option, for an additional five years. The five-year priced option included one each of the three target complexities, e.g., low-fidelity, medium-fidelity, and a high-fidelity target. The CTTS effort includes booster preparation, target design, development, manufacturing, payload integration, testing, and launch services for to-be-determined target systems; most or all boosters will be provided as Government Furnished Property (GFP), such as the SR-19, M57, and others in Government inventory. Targets must be capable of launch from Ranges/test sites such as Kwajalein Missile Range, Wake Island, Pacific Missile Range Facility, White Sands Missile Range, Fort Wingate, Vandenburg Air Force Base, Wallops Flight Facility, land masses near Kwajalein Atoll, and from land, sea, or airborne platforms. Some complete target systems will be GFP Foreign Material assets and design and development efforts for these systems will be limited to modifications for Range Safety and instrumentation purposes. A SECRET facility clearance is required for this effort. Technical Monitor responsibilities are assigned to the lead systems engineer for the S/MRTPO.

The LRTPO has contractual arrangements with Sandia National Laboratories (SNL) and the U.S. Air Force Space and Missile Systems Center (SMC) to provide target payloads and launch and test services, respectively. Both contract relationships are documented in Memoranda of Understanding (MOU) with an indefinite period of performance. However, the MOU with SNL is updated annually. The SNL is

responsible for the fabrication and flight certification of primary and backup target payload systems, conducting pre-launch and launch operations for payload systems, collection of telemetry data, and payload integration into target launch vehicle (TLV) front sections. Deliverables provided by SNL include detailed flight plans, payload systems, integration activities, post-test telemetry, and booster and post-boost vehicle launch services. The SMC provides the front sections for the TLVs, procurement and integration of flight hardware, booster motor refurbishment and inspection, conduct of launch processing, target and launch operations, integration of TLV payloads, and universal documentation system support. Deliverables provided by SMC include mission requirements documents, TLV front sections, boosters, and launch support at Vandenberg Air Force Base.

Future BMD testing will require the capability to launch heavier payloads in a variety of engagement scenarios. The Enhanced Target Delivery System (ETDS) is being developed to support test requirements that cannot be met using currently available target delivery systems. The ETDS study will address the feasibility of launching heavier payloads from remote ground launch sites, stabilized ship platforms, and/or airborne platforms. The ETDS must be capable of being launched from Vandenberg Air Force Base, Kodiak, Alaska, Ronald Reagan Ballistic Missile Defense Test Site (formerly Kwajalein Missile Range), Pacific Missile Range Facility, Kauai Test Facility, and other broad-ocean areas in the Pacific. The ETDS study effort is a firm-fixed-price contract with a period of performance that ended in July 2002. Study contracts were competitively awarded to two contractors. Deliverables for the study effort include a Final Technical Report, Design Data Review Package, and a Test Plan (Master Program Test Plan). Information to be included in deliverables is a design approach, engineering necessary to validate the ETDS, and supporting documentation to include a cost estimate and a schedule for the timeframe necessary for the development and fabrication of the system. A separate solicitation is anticipated for ETDS target system development and production. [Ref. 21]

### **III. MANAGEMENT OF BALLISTIC MISSILE TARGET ACQUISITION**

#### **A. INTRODUCTION**

Chapter III begins with a description of the ballistic missile target acquisition process. The ballistic missile target acquisition process to be described below was in place until October 2001, when the Ballistic Missile Targets Joint Project Office (BMTJPO) was realigned under the MDA. The BMTJPO was re-named the Missile Defense Targets Joint Project Office (MDTJPO) as part of the realignment. Management problems experienced by current and former target Product Managers and Project Managers follows the entire ballistic missile targets acquisition process. The management problems to be analyzed were obtained from current and former Product Managers and Project Managers through the administration of a questionnaire that was e-mailed to them by the author. Chapter III will conclude with the identification of changes to the ballistic missile targets acquisition process as a result of modifications made to the ballistic missile defense system by the BMDO and Missile Defense Agency (MDA) since October 2000.

#### **B. ACQUISITION OF BALLISTIC MISSILE TARGETS**

The MDTJPO provides ballistic missile defense system elements with reliable ballistic missile targets that meet their test and evaluation objectives to ensure that the elements meet their performance and operational requirements. The MDTJPO customers demand agility, faster and more flexible response to emerging requirements, while maintaining quality, cost, and productivity expectations. The MDTJPO employs processes that have proven effective for incorporating change; change in response to changing customer requirements, and change to facilitate process improvement.

The ballistic missile target acquisition processes employed by LRTPO and SMRTPO are very similar with the exception of the contract vehicles used by LRTPO and the players that participate in the process. Contract types and contract structures in use by LRTPO and SMRTPO were described in Chapter II. Given their ballistic missile target acquisition process similarities, only the SMRTPO acquisition process will be described in the following sub-sections.

## 1. Requirements Definition

The Target System Requirements Document (TSRD) formally defines the ballistic missile target performance specifications required by the respective BMDS element. The TSRD defines the threat and/or threats that must be emulated along with the degree of representation, types of payload(s), the number of ballistic missile targets required, types of on-board instrumentation required, the test range and/or test ranges where the flight testing will occur, the schedule, and funding constraints. The MDA-approved TSRD is submitted approximately three years in advance of the need date. The MDTJPO develops a Target Support Plan (TSP) based upon all the requirements identified in the respective BMDS element TSRDs. The TSP identifies how the ballistic missile target performance specifications will be met and highlights any shortfalls where the requirements as specified cannot be met by the existing baseline target set (BTS). The TSP also provides alternatives and recommendations as appropriate, a summary of estimated cost, and the ballistic missile target development schedule. The TSP is then sent to the BMDS element and the MDA for approval. See Figure 10 for a depiction of the TSRD/TSP process.

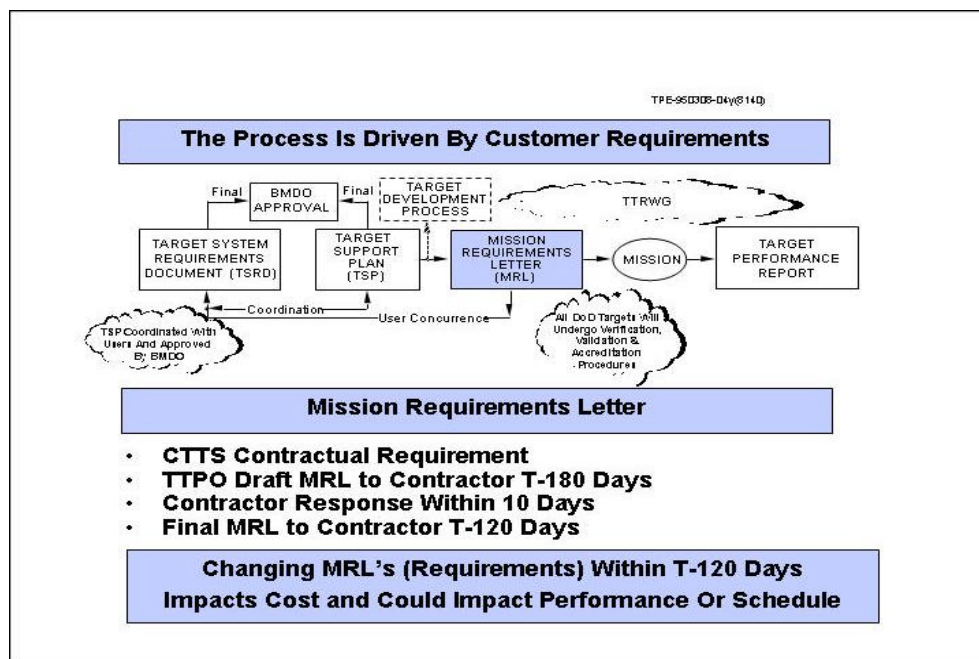


Figure 10. Target System Requirements Document/Target Support Plan Process.



for highly reliable, threat-representative, and cost-effective targets. Four basic principles guide the acquisition strategy: (1) use of Government and commercial off-the-shelf equipment when possible; (2) integration of FMA assets when available and appropriate; (3) use of target delivery methods that provide the tester maximum flexibility; and (4) selection of target systems that require minimal infrastructure support. To be effective, ballistic missile targets must meet user specifications for flight environments, signatures, threat fidelity, and target instrumentation. Target systems can be developed by the same targets contractor or, in some cases, by different contractors. Target systems are integrated and tested at the Contractor's facility prior to being deployed to the launch site where the final integration and test activities are conducted in preparation for target system launch operations. [Ref. 22]

An acquisition strategy is developed after the TSP is approved by the BMDS element and the MDA. The acquisition strategy is developed based upon the number of ballistic missile targets required, whether requirements can be met with existing BTS, with modification of existing BTS, or development of a new ballistic missile target system, threat match specifications, payload and on-board instrumentation requirements, schedule, funding, and other special factors unique to a given acquisition requirement. The acquisition strategy also includes advantages and disadvantages of a competitive or directed source award, recommended task order evaluation board (TOEB) evaluation criteria and task order (T/O) structure, TOEB membership, and schedule for all related activities leading to a T/O award. The acquisition is then briefed to the S/MRTPO Product Manager and MDTJPO Project Manager for approval. Upon MDTJPO approval, the acquisition strategy is forwarded to the MDA for final approval. [Ref. 23]

### **3. Consolidated Theater Targets Services (CTTS) Task Order**

The CTTS contract provides the MDTJPO with a consolidated contract vehicle to obtain ballistic missile targets and launch services in support of BMDS elements. Upon approval of the TSP by the BMDS element and the MDA, the TSP defines the baseline for developing the CTTS T/O. The T/O provides direction and funding to implement the specific requirements identified in the TSRD/TSP and the acquisition strategy. Task Order requirements specified in the T/O Statement of Work (SOW) for target system design, development, modification, fabrication, integration, and testing must meet the



requirements as specified in the CTTS SOW and CTTS Technical Requirements Document (TRD). The ballistic missile target contractor is responsible for the performance of all hardware and software modified and/or developed for use on a given T/O, ensuring proper system integration and test both at the contractor's facility and at the launch site, and providing launch services in accordance with specified customer requirements. [Ref. 24]

#### **4. Systems Engineering Process**

The MDTJPO employs the systems engineering process (SEP) to transform BMDS element ballistic missile target requirements into ballistic missile target systems that meet requirements as specified in customer TSRDs. The SEP shown in Figure 12 forms the foundation for the MDTJPO's target development process. [Ref. 25] The SEP encompasses a comprehensive, iterative technical management process that includes: (1) translating operational requirements into ballistic missile target systems; (2) integrating technical inputs of the entire design team and managing interfaces; (3) characterizing and managing technical risk; (4) transitioning technology from the technology base into program-specific efforts; and (5) verifying that designs meet operational needs. The MDTJPO acquisition process includes three phases of program management: acquisition strategy development, contract solicitation and award and contract management. Customer and stakeholder interface occurs concurrently throughout all three phases. Figure 13 illustrates the formal design reviews that take place as part of MDTJPO's target development and contract management processes and describes the products resulting from each review.

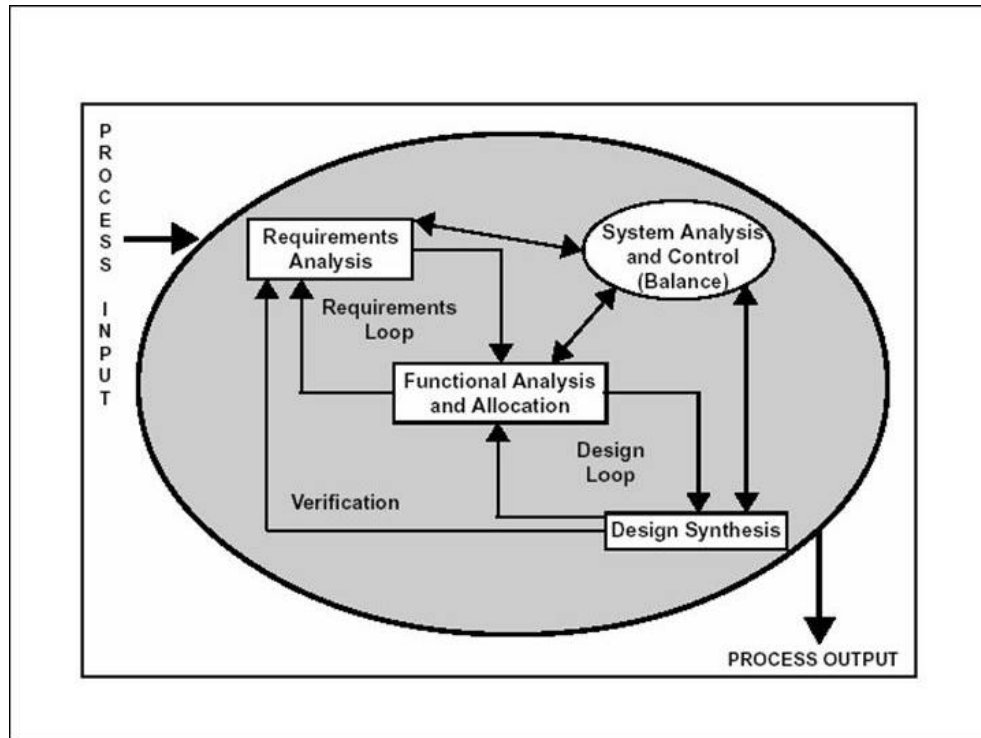


Figure 12. System Engineering Process.

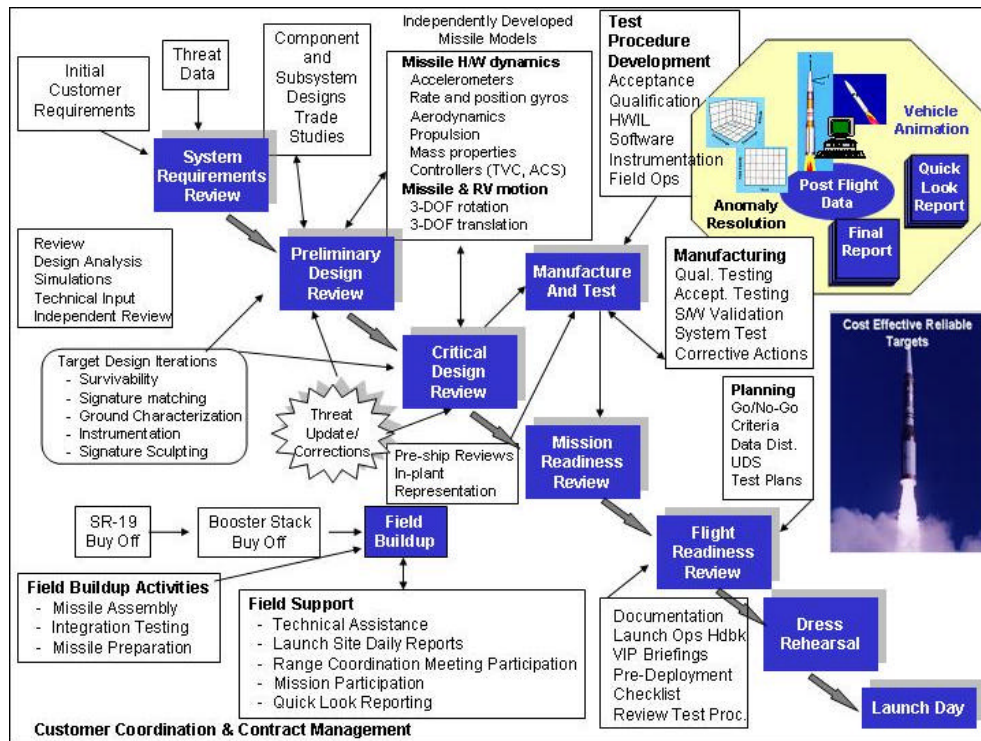


Figure 13. Thorough Formal Review Process.

Contractual provisions are included in the CTTS T/Os to allow for growth in target designs in anticipation of new or revised customer requirements or the opportunity for technology insertions. Cost-benefit analysis are conducted before changes are implemented to ensure proposed changes can reduce ballistic missile target system life-cycle costs or the change(s) offers a significant increase in system reliability.

The MDTJPO closely monitors target system contractors to ensure all performance requirements are met. Assigned product directors are the key to this effort, serving as the primary MDTJPO interface. On-site monitors from within the MDTJPO and support contractors are assigned at the contractor facilities to ensure all contractor activities are running smoothly. The on-site monitors participate in program reviews, assist in hardware development and testing, review and comment on program documents, assess schedule impacts, and provide weekly status reports. When anomalies occur, the on-site monitors provide immediate feedback and advice on initiating corrective actions.

The MDTJPO's formal review process ensures that customer requirements are being met with quality products and services. An extensive testing and validation philosophy has been adopted by the MDTJPO to ensure all operational performance characteristics are met at the component, subsystem, and system level. All design processes, manufacturing processes, and test procedures are documented and approved by the Government for use. Formal qualification and acceptance testing are conducted on target system components which includes: (1) independent modeling and simulation; (2) extensive systems integration testing including software-in-the-loop and hardware-in-the-loop flight simulations; and (3) review and approval of all design, test, and operating procedures. In addition, the MDTJPO employs a risk management process designed to identify risk areas, assign risk levels based upon qualitative/quantitative analyses, developing risk mitigation plans, and continuous monitoring to determine if risk levels and/or risk areas are changing as the target system design matures. [Ref. 26]

Trade-off analyses are conducted by the target system development contract or and MDTJPO support contractors to determine which target configuration of the BTS will meet, or can be modified, to meet customer signature and targets system performance requirements. Typical plots resulting from kinematics match, radar cross-section, and infrared signatures analysis are shown in Figure 14. Hundreds if not thousands of Monte Carlo simulations are run to support the mission-planning phase, to characterize expected target system performance once the mission scenario is finalized, and to meet Range Safety trajectory requirements that are used for their safety analyses.

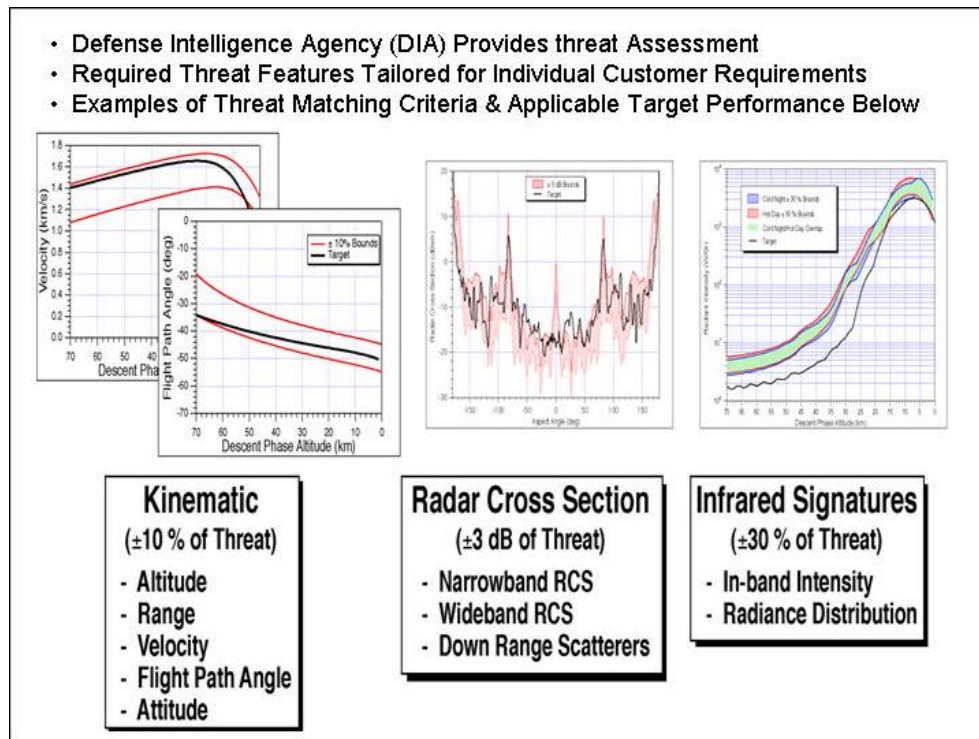


Figure 14. Target/Threat Matching.

## 5. Verification, Validation, and Accreditation

A critical aspect of the CTP is the requirement that all targets used for testing the BMDS are constructed to meet strict specifications set forth by the BMD elements. All ballistic missile targets are required to follow a well-defined target verification, validation, and accreditation process.

The verification process ensures that the ballistic missile target design is consistent with DIA threat descriptions and user test requirements. Target verification is required for new target designs or a target design configuration that is not in the BTS. Once the designs are verified, they are updated as required based on DIA threat definition changes.

The validation process ensures that the ballistic missile target accurately represents the real-world threat as validated by DIA. This is accomplished by a comparison analysis between the target and the intended threat(s) performance. The

validation plan documents, against which threats are to be compared to the target, provide a schedule for the validation milestones. Ultimately, the flight test validates the predicted target performance derived from all target characterization data collected in ground tests.

The accreditation process involves the review and determination by the test authority that the target has met the verification and validation standards and is acceptable for its designed purpose, and will meet their intended use test requirements. The test authority can be the program manager or operational test agency for developmental and operational testing, respectively.

## **6. Mission Requirements Letter**

The detailed BMD element mission-specific requirements are provided to the ballistic missile target contractor in the form of a Mission Requirements Letter (MRL). A MRL is provided both at 180 days (draft) and 120 days (final) prior to each mission. The MRL specifies the detailed flight-specific requirements that the target contractor must meet for a given mission. Detailed mission-specific requirements are a product of the mission planning process produced by a Flight Test Working Group, Target Requirements Working Group, or Test Integration Working Group (example of one-of-many Integrated Product Teams involved) or other working groups associated with mission planning.

After the mission is conducted, the target contractor supports a Post-Flight Data Review hosted by the Government, approximately 30 days after the test event and submits a Post-Flight Report that analyzes all data collected for post-flight analysis approximately 60 days after the test event. All pre-flight, flight, and post-flight requirements are specified in the MRL. Upon approval of the Post-Flight Report by the Government, the target contractor will update the target models as required based upon post-flight data analysis results. [Ref. 27]

## **7. Funding**

Ballistic missile targets are funded through the MDA. Budgets are contained in individual interceptor/sensor Program Management Agreements (PMAs). Each BMD acquisition program must determine the number and type of ballistic missile targets it must test against in order to advance through the acquisition milestones, identify any facility/range modifications required to support their tests, execute the required

environmental documentation, and budget for these expendable resources. These PMAs provide for the development, validation, certification, and general support required for BMD targets and BMD system element tests. Individual tasks are provided in the PMA to support TMD, NMD, and Technology Readiness tests as well as the necessary resources to support the target launches. [Ref. 28]

### **C. MANAGEMENT PROBLEMS EXPERIENCED BY BALLISTIC MISSILE TARGET PRODUCT MANAGERS AND PROJECT MANAGERS**

The data for identifying the management problems experienced by current and former target Product Managers and Project Managers was obtained by the administration of a questionnaire. The author e-mailed fourteen questionnaires that were evenly distributed between Short/Medium-Range Target and Long-Range Target Product Managers and Project Managers. One of the Project Managers also served as a Product Manager. Key management problems were identified in the following areas: requirements, ballistic missile target cost and funding, schedule, and personnel.

#### **1. Requirements**

The key management problems associated with requirements, as identified by the questionnaire responses, include the requirements generation process itself, requirements growth, lack of requirements stability, and new requirements imposed upon on-going ballistic missile target development programs. The ballistic missile target requirements generation process has evolved from using requirements defined in working group minutes during the early 1990's to the TSRD process previously described. Requirements growth and lack of requirement stability present a major challenge, in that, they can impact a PM's entire program, e.g., cost, schedule, and/or system performance.

The most significant management problem identified was the impact to the targets program resulting from changing customer requirements. Changes in customer requirements cause a ripple effect through all target support activities for that program, e.g., contract modification, Range coordination, scheduling, planning, the need for additional funding, etc. Customer requirements changes usually require a great deal of redo work that may include mission planning, trajectory analysis, Range Safety analyses, Range coordination, and/or design modifications. In some cases, customer requirements are delivered late which results in a "reactive response" in an attempt to meet the

customer's requirements. Additional requirements levied on the targets program late in the development process (after target systems have been fabricated) by the MDA, also presents a major management challenge.

## **2. Cost and Funding**

Requirements changes are expensive especially when made after the Critical Design Review (CDR). Customer schedule slips and/or delays also increase target system costs. Continuous pressure from senior leadership to reduce target costs, while maintaining a high success rate, has been a major management challenge throughout the years. Supporting customer requirements and schedule changes for the duration of the ballistic missile target development process makes reducing target system costs virtually impossible.

Funding mismanagement on the part of one of the ballistic missile target contractors was also identified as a significant management problem. The contractor managed the funding for all task orders at the vice president (VP) level, instead of giving it to the respective T/O PMs to manage. The VP was using the funding to pay the entire company workforce, instead of just the workforce directly supporting the T/O activities. Earned value data provided a false picture, given that it was not connected in any way to the work being done. Consequently, all four of the contractor's ballistic missile target T/Os as well as another contract concurrently ran out of funds, with most of the required work left undone.

## **3. Schedule**

Customer schedule slips and/or launch delays have significant impacts on ballistic missile target support. Typically, customer schedule changes occur after the targets development and launch services contract has been awarded. Therefore, any schedule changes will result in cost growth for the targets program.

## **4. System Performance**

System performance is a concern given that requirements changes, in most cases, must be traded-off with system performance. The threat that the ballistic missile targets must emulate is not constant, but rather ever changing, which can have major impacts upon target system performance, e.g., kinematic, RCS, thermal, and optical signatures, under development.



## **5. Personnel**

Recruiting, training, and retaining qualified personnel to meet the demands of a fast-paced Ballistic Missile Target Product Office has been a management problem for several years at MDTJPO. Given the large number of players involved in the target acquisition process, a lack of technical personnel available to execute their assigned responsibilities in any part of the ballistic missile target acquisition process, can have adverse effects upon the targets program.

### **D. CHANGES IN THE BALLISTIC MISSILE TARGET ACQUISITION PROCESS**

The ballistic missile target system development process has been revised into a four-phase target development process. The revised development process, with some minor changes, is very similar to the target development process used in the past. The four phases of the revised target development process include: (1) the requirements development, (2) target program baseline development, (3) target development, Preliminary Design Review and Critical Design Review, and (4) final target validation and certification. Final approval for use of a given target system will be provided by the Director of the MDA at the end of phase four. The revised ballistic missile target development process is shown in Figure 15. A description of key changes to the ballistic missile target acquisition process is included below. The key changes include minor revisions to the target requirements generation process; the addition of two new documents, the Target Program Baseline (TPB) and the Target Development Plan (TDP), Validation and Certification, re-designation of BMDO to MDA, and changes to the baseline MDA acquisition strategy.

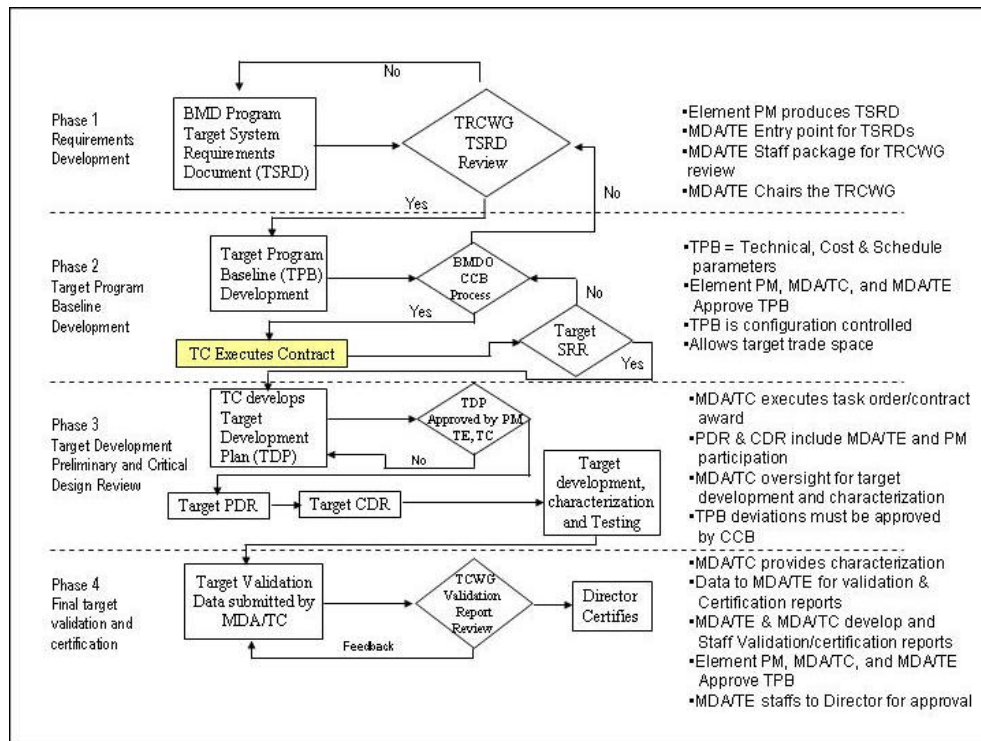


Figure 15. Revised Target Development Process.

## 1. Target Requirements Generation Process

The BMDS Element Program Manager (PM) documents ballistic missile target system(s) requirements in the TSRD during phase 1 of a four-phase process. The TSRD identifies test objectives and required target critical characteristics with tolerances, ranked by criticality. The ranking of the critical characteristics will provide data for potential trade-off analyses that may be required in the future. The TSRD is reviewed by the Target Requirements and Certification Working Group (TRCWG) and approved by the MDA Test and Assessment Directorate (MDA/TE).

## 2. Target Program Baseline

Target Program Baselines and Target Development Plans are formal responses to a TSRD developed by the program element manager. Effectively, the information contained in the previously described Target Support Plan is now included in two separate documents. In phase 2 of the target development process, the TPB identifies test objectives, target critical characteristics (TCCs), or key performance parameters, number

of targets, estimated cost of target system(s), and when and where targets are required. The TPB also defines which TCCs are negotiable and non-negotiable and includes objective and threshold values for the TCCs, cost and scheduled delivery date(s). The TPBs are patterned after the Acquisition Program Baselines intended to document the agreement between element manager, tester, and material developer for the required target system(s). The TPB is signed by MDA Targets and Countermeasures (MDA/TC), MDA/TE, and the BMDS Element PM.

### **3. Target Development Plan**

In phase 3 of the target development process, the Target Development Plan (TDP), when approved by MDA/TC, MDA/TE, and BMDS Element PM, serves as the baseline document for managing the design and development of the target system(s). The TDP describes in detail the target system(s) required and includes the following information: test objectives, identification of TCCs, how the developer is going to achieve the TCCs, identification of target system shortfalls, number of target systems and where and when they are required, the acquisition strategy, detailed cost breakout, issues (treaty compliance and/or constraints), and target availability date(s). The TDP will also include alternatives, trade-off analysis, and/or impacts if the target developer cannot achieve the TCCs. The TDP will be approved approximately 30 days after the target system(s) Systems Requirements Review. Configuration control for the TDPs will be maintained at the MDA level. Upon approval of the TDP, the target development proceeds to the Preliminary Design Review and then the Critical Design Review.

### **4. Target Validation and Certification Process**

During phase 3, a suitable target system to meet customer T&E objectives is designed, developed and acquired. The baseline target specifications, e.g., objective and threshold values for the target critical characteristics, are used to measure progress throughout the target development process. At the end of phase 3, the actual, as-built target is fully characterized with all characterization data distributed to all the key players for incorporation into their respective models and simulations.

In phase 4 of the target development process, the Target Validation Report (TVR) and the Certification Report are prepared. The purpose of the TVR is to document how accurately the target system represents the design-to-threat, based upon its intended use.

The TVR documents the degree of threat representation based on quantitative comparison analysis of the target system to the real world threat as validated by DIA. The Director of the MDA, in response to BMDO Policy Letter #25, dated 12 Oct 2000, promulgated the requirement for target certification. During the target system development and mission planning, there is a validation and several certification events. A Certification Report is prepared after both the Preliminary and Critical Design Reviews and submitted to the TRCWG for approval. The Certification Report compares the target system design against both the BMDS Element requirements and the current threat to determine how well the target system meets the test objectives and the degree of threat representation. The final Certification Report provides the final comparison, based upon its intended use, between the target system and the current validated threat. The comparison analysis determines how well the target system meets the test objectives and threat representation requirements. Upon approval of the Certification Report by the TRCWG the report is sent to the Director, MDA, for his approval.

#### **5. Ballistic Missile Defense Organization's Re-Designation as Missile Defense Agency**

On 2 January 2002, Defense Secretary Donald Rumsfeld issued his direction for the Missile Defense Program. His stated objectives included the establishment of a single program to develop an integrated ballistic missile defense system under the authority of a single organization, the Missile Defense Agency (MDA). He directed that a capability-based requirements process be adopted and that streamlined oversight be incorporated to facilitate the earliest possible deployment of missile defense capabilities to the Services. The following are the top four missile defense priorities included in his guidance for the Department of Defense (DoD): (1) to defend the United States, deployed forces, allies and friends from ballistic missile attack; (2) to employ a Ballistic Missile Defense System (BMDS) that layers defenses to intercept missiles in all phases of their flight (i.e. boost, midcourse, and terminal) against all ranges of threats; (3) to enable the Services to field elements of the overall BMDS as soon as practicable; and (4) to develop and test technologies, use prototype and test assets to provide early capability, if necessary, and improve the effectiveness of deployed capability by inserting new technologies as they become available or when the threat warrants an accelerated capability. In addition, the Secretary cancelled the respective Service Operational Requirements Documents (ORD)

because they were not consistent with proposed BMDS development program objectives. The Services will develop a capability-based ORD that will become operative upon transfer of the capabilities to the Services. The MDA will manage through technical objectives and goals during the transition phase. [Ref. 29]

Re-designation of the Ballistic Missile Defense Organization as the Missile Defense Agency provides greater authority to the Director, MDA, and his staff to manage the rigorous technical challenges associated with developing missile defenses. The additional authorities are necessary due to the magnitude of the program, and the high priority placed upon this effort by the President. It is for these same reasons that the Secretary directed the use of a streamlined oversight process. The Secretary has indicated his intention to look to the DoD Senior Executive Council (SEC) for oversight and recommendations for decision-making in this area. The SEC is chaired by Deputy Secretary Wolfowitz, and includes Under Secretary of Defense for (Acquisition, Technology, and Logistics) (USD (AT&L)) Aldridge, and the Service Secretaries.

Based on Secretary Rumsfeld's direction, the USD (AT&L) issued implementation guidance to the Director of the MDA to plan and execute a single Missile Defense Program, structured to integrate work and enable capability trades across different elements of the BMDS and to facilitate decisive action in response to program events. The BMD program has the same reporting requirements to the Office of the Secretary of Defense (OSD) and Congress that all other programs have. The Director, of the MDA has been given full authority to execute a capability-based acquisition approach that will produce missile defenses at the earliest feasible date. He will have the authority and responsibility to develop all associated technologies and conduct developmental testing. He will interface with the warfighter community to determine desired operational features and to develop strategies for introducing developed capabilities into the fighting forces. He will have the authority to manage the acquisition strategy, make program commitments, award contracts, make affordability tradeoffs, and exercise milestone decision authority up to, but not including, Milestone C which is the beginning of the production and deployment phase.

The unique management and oversight processes described above apply only to the development phase, when the configurations of missile defense systems are still being defined and production and deployment considerations are unknown. Transition to procurement will create an acquisition program in its own right and activate the management, oversight, and reporting processes used for traditional defense acquisition programs. The USD (AT&L) will establish the necessary product teams and processes needed to support a Milestone C production decision by the Defense Acquisition Board (DAB). Following the Milestone C decision, the designated Military Department will manage the program following standard acquisition processes and reporting procedures.

To advise the Director of the MDA on management of the BMD program and to aid the SEC in executive decision-making on missile defense, the USD (AT&L) formed a Missile Defense Support Group (MDSG) of designated senior experts drawn from 13 selected staffs within the Department. The Chairman of the MDSG is the Director of Strategic and Tactical Systems and will report directly to the USD (AT&L) on all MDSG matters. The MDSG will be able to provide useful insights and recommendations on policy, operations, acquisition, and resource matters that affect the BMDS. [Ref. 30]

#### **6. Missile Defense Agency's New Acquisition Strategy**

On 30 August 2002, the Missile Defense Agency Targets and Countermeasures (MDA/TC) posted a draft request for proposal on the Federal Business Opportunities seeking to obtain a Prime Contractor (PC) for the Targets and Countermeasures Program. The Government and PC will assume shared system performance responsibility with active MDA management participation and oversight. Overall program acquisition strategy goals are to establish and execute system-level management, reduce target acquisition cycle time, contain program costs and maintain mission success.

Using Full and Open Competition, MDA is soliciting an Award-Term contract with a 4-year basic period of performance, with up to two 3-year award terms to follow based on continuing need and successful contractor performance. The prime contract will be a Cost-Plus Award Fee/Incentive Fee/Fixed Fee/Fixed Price type contract. The contract will utilize separate contract line item numbers (CLINs), and in some cases, sub - CLINs, to distinguish between the types of work and the degree of performance risk entailed. Supplies and services sought fall into the five broad categories listed below.

Note that the work content is described for illustrative purposes only and is not inclusive of all potential tasks applicable to the contract.

***a. Program Management***

Program management includes program planning, program controls, risk management, reviews and analysis, financial management utilizing an Earned Value Management System (EVMS), automated information management, and paperless delivery of products. Government access to the contractor's own program management toolkit and data is expected in order to enable maximum commonality in management controls and reporting.

***b. Systems Engineering***

Systems Engineering includes systems analysis, concept definition of new products, integration of performance requirements across the targets portfolio, configuration management of target program baselines, modeling and simulation, adversary capability analysis, mission planning and launch support equipment development from a systems perspective, preflight and post-flight analysis and technical reviews.

***c. Asset Management***

Long-lead asset management involves identification of critical long-lead items, budgeting and managing acquisition of key modules or components, storage, booster aging surveillance plans and execution of routine and special purpose testing, obsolescence mitigation and analytical support to determine application to future element or system testing events. Assets range from full-up targets, utilizing both domestic and foreign materiel, to modules such as reentry vehicles, decoys, or telemetry packages, to components including such things as sensors, chaff or critical countermeasure components.

***d. Acquisition and Presentation***

This includes the Design and development of new target capability, procurement of individual flight articles for use in experimentation, element or system tests, integration of long-lead and new materiel to produce full-up targets loaded with payloads appropriate to a specific mission, mission integration on designated ranges, transportation and handling, target assembly and checkout on-site, launch operations,

data production, receipt, processing and reporting, documentation, and mission analysis. This work will depend to some extent on Government Furnished Equipment, particularly in the area of boosters. At this time, boosters are available from Service sources, both the Air Force and Navy, Department of Energy, and some commercial sources (foreign and domestic). The prime contractor is expected to exercise diligence to form and sustain robust linkages with critical external organizations to best ensure mission success.

*e. Special Studies*

Make or buy studies, business case analysis, technical trade studies, identification of START and INF Treaty compliance issues, risk identification and mitigation paths, failure analysis, assessment of commercial material, evaluation of foreign or domestic hardware, and supplier recommendations are included under special studies. [Ref. 31]



## **IV. ANALYSIS OF BALLISTIC MISSILE TARGET MANAGEMENT PROBLEMS**

### **A. INTRODUCTION**

The MDTJPO has embraced the Baldrige-based Army Performance Improvement Criteria as a management framework for their strategic planning and organization of their efforts to ensure their sustained leadership in workforce and performance excellence. The MDTJPO is committed to providing best value targets for their customers. Their definition of best value defines it as not only high-quality targets delivered on-time but efficient, fiscally-responsible program management as well. The MDTJPO combines continuous learning process improvement, and a series of internal and external assessments to measure and compare their performance. The MDTJPO leadership periodically reviews the results of the internal and external assessments and initiates corrective actions to address shortfalls, as required. The MDTJPO strives to keep their current customers satisfied as they pursue new business opportunities, enhance their target delivery systems, and work to improve overall performance. Integrated Product Teams (IPT) consisting of the Government, MDTJPO support contractor, targets the development contractor, and customer representatives are utilized to accomplish a multitude of tasks associated with managing ballistic missile target programs. Independent Review Teams (IRT) are also utilized early and throughout the development process to ensure that target contractors have a good understanding of the customer requirements, and their preliminary and critical system designs are robust, technically-sound, and achievable within schedule constraints and within acceptable risk levels. By using a horizontal management structure, decision-making authority and responsibilities are driven down to the lowest level possible, thus promoting higher productivity, increased innovation, and enhancing team-member initiative within the organization. [Ref. 32]

### **B. ANALYSIS OF MANAGEMENT PROBLEMS EXPERIENCED BY BALLISTIC MISSILE TARGET PRODUCT MANAGERS AND PROJECT MANAGERS**

Fourteen questionnaires were emailed to current and former ballistic missile target Product Managers and Project Managers. One of the Project Managers also served

as Product Manager. The questionnaire is included for reference in Appendix B. Twelve of the fourteen questionnaires were returned. The areas where key management problems were identified are requirements, cost and funding, schedule, system performance and personnel. Given the dynamic environment in which the MDTJPO supports the BMDS elements, the MDTJPO has implemented organizational, business, and strategic planning techniques to deal with the management challenges. The information described below was summarized from the responses received. Before going into the specific management problem areas, the researcher would like to provide some background information on the target Product Manager and Project Manager Management styles, organizational structure, and Product Manager and Project Manager ballistic missile target acquisition process interaction.

The management styles, based on a self-assessment provided by each of the questionnaire responders, were very similar. The different management styles identified include: (1) by exception; (2) by participation and walking around; (3) micro-delegator; (4) by walking around, objectives, participation, empowering, and delegating; (5) a combination of goal-orientated using milestones and a base-line plan as a tool; (6) by participation; (7) by objectives; (8) "I encouraged participation in collecting the facts with my Executive Steering Group of advisors, then I made the decision;" (9) by active participation in decision-making and considerable management by walking around; (10) by consensus through coaching, communicating, and walking around; (11) combination of participation and walking around; and (12) "principal staff advisory group with my ultimate decision and walking around to stay in-touch with the employees." The responder who described himself as a micro-delegator described his management style as follows:

I assigned tasks to people with more or less detailed guidance as I thought the situation required and watched their progress. I tried to take bold, direct action, meeting the customers need, but treating my team members with respect and seeking consensus within the office. I believe that my involved style probably limited independent action in some. [Ref. 33]

Basically, the managers gave their employees clear direction, responsibility, empowerment, and, within their demonstrated abilities, the freedom to carry out that

direction, while keeping the managers informed. Employees were also encouraged to ask for help when they needed help with something outside of their span of control.

The Targets Office has been known by several names, has experienced several re-organizations, and has been a part of several different organizations through the years. Overall, the organizational structure, e.g., Project Manager, two Product Managers, and two support divisions providing direct support to the Product Managers, has remained very similar to the organizational structure currently in place in December 2002. The organizational structures within the Product Offices and the Support Divisions have changed, and in some cases significantly, from the organizational structures described in Chapter II. One of the Product Managers described the reasons for changing the organizational structure of the Product Office. The reasons he identified included to promote “teamwork”, foster an environment of open communication, capitalize on a well-trained workforce, strive for continuous improvement, meet our customers needs and to develop a sense of ownership and responsibility through empowerment. However, customer-focused organizational structure has been in place since around 1993.

Product Managers were very involved throughout the various processes associated with the acquisition of ballistic missile targets. Typically, they provided direction and guidance for the development, acquisition, product improvements and testing of ballistic missile targets. They reviewed validations and certification documentation and approved the respective acquisition strategies, TSPs and briefed the acquisition strategy up the management chain for concurrence. They chaired all major reviews, e.g., System Requirements Reviews, Preliminary Design Reviews, Critical Design Reviews, etc., authorized shipment to the range at the pre-ship reviews and briefed target readiness to the Executive Steering Group. Product Managers supported high-level meetings and briefing, as required, to ensure that their program status was known and understood.

The Project Managers also participated in the major reviews. However, most of their time was spent at MDA/BMDO and OSD, up the chain-of-command, promoting the targets program to gain support for the program and interfacing with BMDS element/MDAP program managers and/or test chiefs to provide feedback on expensive or

risky target system requirements. The Project Managers also provided final approval at the Targets Office/MDTJPO level for budgets, correspondence, documentation, etc.

## **1. Requirements**

All MDTJPO customers demand agility, faster and more flexible response to emerging requirements, and on-time delivery, all the while maintaining quality, cost-effective, and productivity expectations. Changes in customer requirements can occur at anytime during the ballistic missile target development process. Contractual provisions are included in CTTS T/Os to allow for growth in target designs in anticipation of new or revised customer requirements or opportunities for technology insertion. Specific ballistic missile target performance requirements and test objectives vary significantly between the BMDS elements, and in some cases, within a given BMDS element. The respective Product Offices and the Support Divisions have been organized and management systems developed to ensure that each customer's unique requirements are met. Requirements-related management problems are dealt with primarily through the IPTs working closely with the customers. This allows communication to flow in both directions. The MDTJPO is provided with information needed to ensure they totally understand the customer's needs and constraints, and the customers are provided with target support options along with associated costs. Bottom-line changes in customer ballistic missile target requirements do not support efficient management of the overall targets program. However, the MDTJPO has managed to accommodate changing customer requirements until additional process improvements are agreed to and implemented. Unfortunately, meeting changing customer requirements results in increased ballistic missile targets system costs.

## **2. Cost and Funding**

Managing-to-budget is a priority for the MDTJPO. They carefully coordinate all budget development and execution activities to balance mission requirements and workloads against authorized funding. The Product Support Division conducts Earned Value Management (EVM) analysis as a formal quantitative and qualitative mechanism to track cost and schedule variances to assist the MDTJPO in monitoring ballistic missile target development contractor performance.

Several targets cost analysis have been conducted since 1997. One of the Product Managers addressed the findings as follows:

During my tenure, several cost studies were performed by outside consultants to evaluate this issue. However, the study results always stated the targets program is well-managed, the overall cost of the targets program was less than one percent of the total Major Defense Acquisition Programs (MDAPs) budget and that the customer schedule and target requirement changes is still the major reason for targets cost increase. The cost studies also recommended that the MDAP stabilize their requirements and that the MDAPs should model their programs after the targets program. Even though the study result was positive and the targets program very successful, the overall target cost issue remained the biggest concern of the BMDO senior leadership. [Ref. 34]

The funding mismanagement problem was taken care of by delaying the joint development program and two of the task orders by 6-12 months. Fortunately, customer schedule impacts were minimal given that the joint program development was not required until fiscal year 2005 and the targets systems being developed by the two T/Os would have met the customer's schedule had the program not been canceled. The cost growth on the development program was unavoidable given the circumstances. [Ref. 35] In the end, the MDTJPO has to trade-off cost growth in order to meet changing customer technical requirements, schedules and system performance requirements.

### **3. Schedule**

Schedule delays are unavoidable when they are caused from outside of your span of control. Historically, customer schedule and/or launch delays have been caused by their ground test failures and/or in-flight failures. Any major defense acquisition program/BMDS element or supporting target system, ground or flight failure, can result in significant schedule delays. The length of the delay is driven by the type of failure experienced and what it will take to correct the problem. The longer the delays, the more significant is the cost growth. According to the MDTJPO business results section of their President's Quality Award Program 2001 submittal, they reduced their procurement action lead time by 60 percent, from 245 days to 145 days, and saved 66 percent over the cost of using separate procurement actions by implementing the Consolidated Theater Targets Services (CTTS) acquisition strategy. Therefore, the MDTJPO can implement

contract modifications in a timely manner, thus minimizing the potential for additional schedule impacts.

#### **4. System Performance**

Total mission success is dependent upon execution of routine daily tasks. To ensure key performance requirements are met, MDTJPO's product directors engage in daily communication with their customers, stakeholders, and target development contractors. Target components undergo formal qualification and acceptance testing, to ensure all operational performance requirements are met at the component, subsystem, and system-level. Thorough testing allows the target's development contractor to be completely familiar with the hardware and software before deployment to the test site. This knowledge allows the contractor, when test anomalies are discovered, to implement corrective actions in the field based upon test data collected at the contractor's facility. All customer requirement changes and/or technology insertion activities must be carefully analyzed to ensure that target system performance is not degraded.

#### **5. Personnel**

The MDTJPO has developed and implemented a plan to recruit, train, and retain high performing employees. One of the MDTJPO strategic goals is to "develop and retain high performing employees committed to MDTJPO success." By using a horizontal management structure, the MDTJPO drives decision-making authority and responsibilities down to the lowest level possible. The MDTJPO relies upon their employee's knowledge, skills, and innovative creativity to facilitate continuous performance improvement. Senior leaders in the MDTJPO believe that one of their most important responsibilities is motivating their employees to develop and utilize their full potential. They accomplish this responsibility by setting clear objectives for developing and retaining high performing employees. They interact personally with employees to ensure good and clear communication, sharing knowledge and information during staff meetings, emphasize employee education and leadership development training, and MDTJPO-sponsored training is tailored to meet the needs of their workforce. Employees are encouraged to seek further education. The AAC employees are required to pursue 80 hours of training every two years. In addition to formal training, they use developmental assignments, on-the-job training, and mentoring to develop future leaders.

Supervisor-employee counseling sessions are held at least three times per year to ensure adequate progress is made towards the employee's performance objectives. The MDTJPO has implemented a recognition system that aligns individual and team contributions with organizational goals and objectives. The MDTJPO reinforces the value of innovation and exceptional performance by rewarding individuals and/or teams with monetary (On-the-Spot and Special Act Cash Awards) and non-monetary (time-off) awards. [Ref. 36]

## **C. ANALYSIS OF CHANGES IN THE BALLISTIC MISSILE TARGET ACQUISITION PROCESS**

### **1. Revised Target Development Process**

The revised targets development process made only minor changes to the existing ballistic missile target acquisition process. Customer requirements as defined in the TSRD and the TSP that documented how the customer's target requirements would be met by the Targets Office, now the MDTJPO, have been in place since about 1993. The TSRDs were developed by the MDAPs, now BMDS elements, and the TSPs were developed by the MDTJPO. Both of these documents were approved by BMDO, now the MDA. For example, the Theater Target Requirements Working Group was chartered to allow for early requirements definition and coordination activities between the BMDS elements and the Theater Targets Product Office, now S/MRTPO. Target verification, validation, and accreditation (VV&A) activities were also accomplished to enhance the credibility of MDA testing. In October 2000, the Director, of MDA directed that all targets used for testing the BMDS would be certified for use by the Director, to ensure that threat definitions are standardized and applied uniformly across the BMD mission area.

All of the elements of the ballistic missile targets acquisition process referred to above are reflected in the revised target development process. The Target Baseline Plan (TBP) was added to the process in an attempt to control requirements changes and cost growth. Only time will tell if using a TBP in the process will be successful in controlling requirements and cost growth. There is currently no data either to support or disprove this premise.

## **2. Ballistic Missile Defense Organization Re-Designated as Missile Defense Agency**

The Missile Defense Agency (MDA) is interfacing with the warfighters, the Combatant Commanders, and the Services to incrementally develop a layered defense Ballistic Missile Defense System (BMDS). These increments will be transferred to the Services for production and deployment as soon as practicable. The BMDS will have the capability to engage short, medium, and long-range ballistic missile threats during all phases of flight (boost, midcourse, and terminal). A key tenet of the BMD Program is to conduct robust, realistic testing which includes flight tests, ground simulations, hardware-in-the-loop, and parallel development efforts for risk reduction. The acquisition approach capitalizes on advances in missile defense technology and allows for adjustment based upon changes in external factors, e.g., threat, policy, and priorities. The BMDS acquisition approach will be designed to defeat ballistic missile target capabilities that any adversary could have within a given timeframe, versus designing a system in response to a clearly-defined threat from a known adversary. The MDA, the Combatant Commanders, Services, and industry are developing initial capability standards. Capability-based acquisition requires continual assessment of technical and operational alternatives at the BMD element and system levels.

Annual assessments will include evaluations of BMDS element performance, system architecture, technological and basing alternatives, and the threat. The initial goal is to provide limited protection against the long-range threat for the U.S., and potentially our allies, sometime between 2004 and 2008. Engineering processes will be guided by Configuration Management and Risk Management. The previously existing Service Operational Requirements Documents (ORD), cancelled by the Secretary of Defense, will be used as reference documents only. The BMD acquisition strategy engineers and tests the system using a two-year capability "Block" approach, with the initial introduction of elements into the expanded Test Bed starting as early as fiscal year (FY) 2004. The initial BMD System capability (Block 2004) will evolve as technologies mature and are demonstrated satisfactorily in the BMDS Test Bed. The BMDS capability will continue to evolve incrementally in future Blocks through the introduction of new sensor and weapon components, and by augmenting or upgrading existing capabilities.



Each BMDS Block will be comprised of selected element configurations integrated into the over-all BMDS battle management command and control (BMC2).

The current BMDS consists of the terminal defense segment (TDS), mid-course defense segment (MDS), boost defense segment (BDS), sensor segment, and technology segment. The TDS elements include Theater High Altitude Area Defense (THAAD), PATRIOT Advanced Capability 3 (PAC-3), Medium Extended Air Defense System (MEADS) and the Israeli Arrow Deployability Program. The MDS elements include Ground-Based Midcourse Defense (GMD) and the Aegis BMD. Finally, the BDS elements include the Airborne Laser and the Kinetic Energy Boost defense activity that reduces the technical and programmatic risks of fielding a boost-phase interceptor capability.

The BMD System will counter the full spectrum of ballistic missile threats, capitalize on existing technologies and capabilities, and foster innovation. It will incrementally incorporate capabilities needed to detect, track, intercept, and destroy ballistic missiles in all phases of flight using kinetic and directed energy kill mechanisms and various deployment approaches. We have implemented a disciplined and flexible acquisition strategy to provide a timely, capable system. This approach protects against uncertainty by ensuring that the United States will have the ability to defend itself, its deployed forces, allies, and friends from a ballistic missile attack should the need arise. [Ref. 37]

The MDTJPO is working with the BMDS elements to develop the next phase of requirements documentation, reviewing TSRDs and developing targets development documentation for THAAD, PAC-3, and Arrow, and/or providing ballistic missile target system support to current test requirements for GMD, PAC-3, ABL, and Aegis BMD. The current targets development process should, with minor adjustments, be adaptable to the capabilities-based defense approach. The major concern is how similar to the current DIA validated threat set, based upon known adversaries, it will be to the threats defined in the first release of the ACRD Block 2004. Major differences will require significant modifications to the current Ballistic Target Set (BTS) that may result in significant cost and schedule impacts to the targets program. The key to success will be based upon adversary threat requirements stability from block-to-block.

### **3. Missile Defense Agency's New Acquisition Strategy**

Products and services described in Chapter III identify all the support activities that the MDTJPO is currently providing under the Consolidated Targets Program. The change in MDTJPO's role when the Prime Contractor (PC) for the Targets and Countermeasures Program contract is selected has not been specifically defined at this time. Preliminary information provided to the MDTJPO is that their management and oversight roles and responsibilities are expected to be similar to current roles and responsibilities. However, the size of the organization will probably be smaller.

The MDTJPO has established a cumulative success rate of 95 percent since 1993, according to the MDA/TC fact sheet. During this time, the Targets Program launched more than 120 short-range to long-range targets from various launch sites. The uncertainties of what role the MDTJPO will play when the PC is selected, remains to be seen. It would be a shame to lose the body-of-knowledge and expertise that has been assembled by the MDTJPO.

### **4. Summary of Key Changes**

In general, only minor changes have been made to the revised targets development process. However, the decision authority level has been elevated to higher levels. Key decisions are now made at the MDA/TE and MDA/TC level. One of the respondents stated his concern as follows:

The changes to the organizational relationships have had a widespread effect on the program. Decision-making and coordination has been raised to a high level in MDA, with too many staff elements required to review and study issues that are already well known in the targets community. The influence of the USAF booster providers has also become more prominent, resulting in further impediments to important MDA programs as they are exposed to Service interests. Withdrawal of decision-making authority to higher levels became a significant problem. There were several opportunities to build a long-term, stable, efficient program, but they were often sacrificed to short-term funding needs, change requests, and organizational conflicts. [Ref. 38]

Many of the changes resulting from the new capabilities-based defense approach were directed at being able to provide the best defense possible against the projected threats, with the use of incremental BMD capabilities, to be fielded as soon as practicable. These changes will increase the number of decisions to be made and drive

the need for timely decision-making. The challenge will be to develop procedures that will provide critical decisions on ballistic missile targets from higher levels in a timely manner.

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## **V. CONCLUSIONS AND RECOMMENDATIONS**

### **A. CONCLUSIONS**

The current ballistic missile defense concept uses a layered defense approach that will be capable of engaging short, medium, and long-range ballistic missile threats. The plan is to increase the layered defense capability by incrementally deploying layered defenses that use complementary interceptors, sensors, battle management, and command and control (BMC2) systems. This approach allows for multiple engagement opportunities against threat targets during the boost, mid-course, and terminal phases of flight. The layered defense approach is structured to allow adjustments driven by changing engineering, schedule, and cost uncertainties inherent in the development of a missile defense system and changing capabilities-based threat definitions. The Department will continue to pursue promising technologies and approaches towards BMD, to field an effective, reliable, and affordable BMDS at the earliest date possible. [Ref. 39]

The MDA Systems Engineering and Integration (MDA/SE) is responsible for planning, oversight, and execution of the systems engineering and integration activities of the BMD Program. The MDA/SE will develop capability-based requirements and employ the classical systems engineering process, to ensure the integration of the BMDS Elements across the layered defense tiers. The Directorates within MDA/SE include: System Definition, Capability Allocation, Systems Analyses, Block Integration and Management, Verification; Engineering Control, and Element Design. The System Definition Directorate is responsible for the overall definition of the BMDS. Technical Objective Goals (TOG) will be established to set top-level objectives and measures that will guide the development of the BMDS. The TOG is derived from policy guidance, user requirements, fiscal constraints, predicted capability, and operational considerations. An Adversary Capability Reference Document (ACRD) will also be developed and maintained that drives the development of the BMDS Blocks and Elements. The ACRD provides a common stable, configuration controlled threat specifications across all BMDS activities. Specific capability requirements derived from the TOG and System

Capability Specifications that are executable in Blocks will be allocated to the Elements along with interface specifications to ensure an integrated capability. [Ref. 40]

The MDTJPO is supporting critical BMDS element needs by providing ballistic missile targets that meet their threat and test objectives. The ballistic missile targets have emulated real-world threats in realistic operational test environments to assess BMDS element development maturity and to determine if the elements were operationally effective, suitable and survivable. In the past, ballistic missile targets were required to be threat-representative within a specified degree of representation defined by the BMDS elements and operational test agencies. The threats that were emulated were based upon those validated by DIA. Transitioning the ballistic missile targets acquisition process into a capabilities-based approach should only require some minor tweaks to the process already in place. The 2002 Annual Defense report defines the capabilities-based approach as follows:

The new U.S. defense strategy is built around the concept of shifting to a “capabilities-based” approach to defense. That concept reflects the fact that the U.S. cannot know with confidence what nation, combination of nations, or non-state actors will pose threats to vital U.S. interests or those of our allies and friends decades from now. It is possible, however, to anticipate the capabilities that an adversary might employ to coerce its neighbors, deter the U.S. from acting in defense of its allies and friends, or directly attack the U.S. or its deployed forces. A capabilities-based model—one that focuses more on how an adversary might fight than on whom the adversary might be and where a war might occur—broadens the strategic perspective. It requires identifying capabilities that U.S. military forces will need to deter and defeat adversaries who will rely on surprise, deception, and asymmetric warfare to achieve their objectives. Because such adversaries are looking for U.S. military vulnerabilities and building capabilities to exploit them, the Department is shoring up potential weak spots (e.g., by strengthening our information protection capabilities and developing countermeasures to anti-access threats) to close off such avenues of attack.

The ACRD described above will identify the threats that ballistic missile targets must emulate in a capabilities-based approach to defense. The Ballistic Missile Reference Document (BMRD) has been used to document DIA validated threats since 1997. Transition to a capabilities-based defense approach with the current ballistic missile target acquisition process and existing Ballistic Target Set (BTS) may be fairly

smooth, if the ACRD provides the same DIA-validated threat information, with the addition of capability-based blocks, as contained in the BMRD. The level of modifications required to the existing BTS will depend upon how similar the initial and subsequent capabilities-based threat definitions are to the current DIA-validated threats defined in the BMRD. The BMDS Blocks will be updated every two years, beginning in FY 2004. Therefore, if there are significant changes in the threat definition from the current and/or from block-to-block, modification and schedule costs could be substantial. In this researcher's opinion, the greatest problem associated with ballistic missile target system threat emulation in the future will be the problem of, how does one design a ballistic missile target system using an open system design approach that will minimize the schedule and costs associated with making design modifications to an existing target system or BTS? The degree of capabilities-based threat definition stability from block-to-block will determine the number and level of modifications required to the BTS or future ballistic missile target systems.

The MDTJPO should continue to improve on their 2001 Alabama Quality Award-winning Strategic Planning process. The award recognizes and honors organizations using effective productivity and quality improvement strategies, techniques, or practices that can be shared with other organizations with the expectation that they will contribute to the overall economic well-being of Alabama. The MDTJPO has developed and implemented an effective strategic planning process as evidenced by winning the 2001 Alabama Quality Award in the service sector category.

The MDTJPO was selected because the examiners and judges were impressed with the productivity and quality efforts in which MDTJPO, its staff, and others associated with the organization have engaged, as well as the commitment and leadership shown in these efforts and their impacts.  
[Ref. 41]

The MDTJPO strategic planning process has been a great help in supporting BMDS element target system requirements. An effective strategic planning process forces an organization both to be customer-focused and to establish strong communication lines between customers, stakeholders, and target system development contractors. The targets program has launched more than 120 targets since 1993, establishing a success rate of 95 percent. Based upon their success rate, the MDTJPO has

been very successful in supporting their customer ballistic missile target system requirements. [Ref. 42]

Ballistic Missile Defense, and the role that MDTJPO will play in it, is a complex and politically-charged issue, shaped by world events, public opinion and the federal budget. The MDTJPO should continue to insert new technologies to meet evolving customer needs and to operate efficiently in order to retain and expand their customer base.

## **B. RECOMMENDATIONS**

The MDTJPO and MDA/TC should invest in consulting services to develop a stakeholder analysis for the organization. The stakeholder analysis involves identifying and prioritizing key stakeholders, assessing their needs, collecting ideas from them, and integrating this knowledge into strategic management processes such as the establishment of strategic direction and the formulation and implementation of strategies. On the other hand, stakeholder management includes communicating, negotiating, contracting, and managing relationships with stakeholders, and motivating them to behave in ways that are beneficial to both the organization and its other stakeholders. [Ref. 43] The information gained from this analysis would augment their successful strategic planning process with a Strategic Management Plan. Understanding stakeholder cultures is also a key to successful Strategic Management. Each stakeholder has strengths and weaknesses, both real and alleged; and all opinions need to be examined objectively. [Ref. 44] Given the dynamic environment involved in providing ballistic missile target support, the MDTJPO should continue to build-on their close working relationships with their customers, stakeholders, and target developers. These relationships have proven to be mutually beneficial.

Selling the targets program is a must. Selling the targets program vertically and horizontally is critical to the success of the organization. All the players must understand that it is not just a “target,” but a complex aerospace system that includes a reentry vehicle, payload(s) (decoys, submunitions, replicas, etc), booster system, guidance and control system, attitude control system, instrumentation, flight termination system, and launch and ground support equipment. The presentation of a threat-representative ballistic missile target “in the basket” is the culmination of many hours spent in



designing, prototyping, developing, procuring, certifying, and qualifying the target(s). Customers need to be educated concerning the intricacies of the targets business. One can never have enough support when trying to fend off program attackers.

The MDTJPO should consider establishing a working group such as the Theater Targets Requirements Working Group (TTRWG). This working group would address short/medium-range and long-range ballistic missile target requirements, costs, etc. A single working group would ensure that information on issue resolution would be shared across all BMDS segments.

The TTRWG allowed the users, test community, test ranges and material developers to coordinate schedules, cooperate in defining new requirements/cost trades, and to communicate the importance of stabilizing user requirements in an effort to meet their aggressive schedules. This process seemed to work extremely well – targets were always available to satisfy the user's needs. [Ref. 45]

Information and documentation being developed by the MDA/SE as they define the capabilities-based BMD System Definition, Capability Allocation, System Analysis, Block Integration Management, Verification, and Engineering Control to your work force should be disseminated as soon as they become available. Employees will be able to use this information to identify shortfalls and/or disconnects within the target development process and provide possible innovative solutions as soon as possible.

Establishing and maintaining competition in the ballistic missile targets industrial base is critical. Therefore, the MDTJPO and MDA/TC have to ensure that they offer incentives, with appropriate stability and infrastructure, to contractors that make up the industrial base, to prevent them from exiting the targets business. Customers must understand that timely and realistic requirements definition should result in target cost savings. The ability to award a T/O, based upon a competitive versus a directed-source award, will provide the best value to the customer. If the requirements arrive late, there may not be enough time to compete the award and still make the schedule, thus resulting in higher target costs for the customer. Typically, the targets contractor that builds the prototype will also build the targets required to meet customer test objectives. Therefore, being able to compete all task orders when requirements are provided on time

(requirements definition lead times for both LRTPO and S/MRTPO are 36 months) should result in cost savings for the customer.

Tight schedules also provide many opportunities for disaster. During the range integration activities with a new commercial range, several key meetings were held in parallel. Therefore, all key area subject matter experts were not able to attend all meetings. As a result, key hardware issues and procedures were missed, which in turn led to the only failure in 20 targets launches since August 2001.

Acquisition issues often take a back seat to politically -driven decisions that have significant influence on overall program structure. A PM at any level cannot rely on “topcover” while executing the program. He/she must remain alert to high-level issues and take immediate action to maintain the stability and effectiveness of the program. The PM must consistently place important issues in front of their leadership for resolution, and drive for closure. [Ref. 46] In many instances, decisions are made based upon political pressures and not on pure technical merit.

The following includes short bullet-type lessons learned that were obtained from the questionnaire responses:

- The MDTJPO leadership must clearly establish the direction for their team and articulate and focus on the mission
- The MDTJPO and MDA/TC should re-evaluate the use of a federally-funded research and development center as the key provider of long-range target payloads, especially if cost is a concern
- Decentralize, and delegate authority commensurate with level of responsibility. Success depends upon everyone pulling together to accomplish stated goals.
- Encourage your employees to focus on accomplishments and not upon the opportunities to do something wrong. Foster an environment for open communications, develop a sense of ownership through empowerment, and strive for continuous improvement.
- Communication is the key. Attempt to keep everyone informed on the status of your program. Avoid surprises! Communications are the most fundamental element of team and trust-building.
- As target providers, do not get on the BMDS element PMs radar screen or his/her critical path
- Take care of your employees and they will take care of you!

- The Target PMs award contracts to a single target developer for the payload and delivery vehicle or assumes the risk as the systems integrator if he/she awards the effort to multiple contractors
- Putting complex targets on-the-shelf until needed cannot be accomplished without significant risk
- Targets team success is usually completely transparent to people outside the targets office. The targets team only gets visibility or attention when it is unsuccessful.
- A PM's word and his/her actions become the yardstick on how the PM and his/her program are measured. Be honest, fair, hold people accountable, and you will gain respect and improve your program's chances for success.

## **C. AREAS FOR FURTHER RESEARCH**

### **1. Inventory Management Practices**

Research inventory management practices and techniques to determine the best inventory management approach for ballistic missile target system components. The inventory would be required to meet respective BMDS element target system requirements and test objectives. An inventory system as described above could provide some economic -efficiencies and reduce cycle times for providing capability-based or threat-representative target system support.

### **2. Ballistic Missile Target Capable of Meeting all BMDS Element Requirements**

Research the feasibility of developing a capability-based or threat-representative target system for a given threat or threat set that will meet all BMDS element ballistic missile target system T&E objectives. Evolving ballistic missile target threats that are constantly changing and different BMDS element T&E objectives makes this possibility a major challenge. However, significant cost savings could result if the research were able to identify a feasible approach.

### **3. Strategic Management Techniques**

Research strategic management techniques to determine how these techniques could be used to develop strategic management plans that address the ballistic missile target management challenges identified by this research. Several changes to the ballistic missile target acquisition process are expected within the next two years following

December 2002 that could either alleviate some of the current management challenges, or create additional management challenges to address.

## APPENDIX A. ACRONYM LIST

AAC	Army Acquisition Corps
ACAT	Acquisition Category
ACRD	Adversary Capability Reference Document
APB	Acquisition Program Baseline
BMD	Ballistic Missile Defense
BMDO	Ballistic Missile Defense Command
BMRD	Ballistic Missile Reference Document
BMDS	Ballistic Missile Defense System
BMT	Ballistic Missile Target
BMTJPO	Ballistic Missile Targets Joint Project Office
BTS	Baseline Target Set
C4ISR	Command, Control, Communications, Computers, Intelligence Surveillance Reconnaissance
CAIV	Cost as an Independent Variable
CCS	Coast Control System
CDR	Critical Design Review
CJCSI	Chief of Joint Chiefs of Staff
CLIN	Contract Line Item Number
CRD	Capstone Requirements Document
CTP	Consolidated Targets Plan
CTPP	Consolidated Targets Program Plan
CTTS	Consolidated Theater Targets Services
DA	Department of the Army
DAB	Defense Acquisition Board
dB	Decibels
DIA	Defense Intelligence Agency
DoD	Department of Defense
DoDD	Department of Defense Directive
DOT&E	Director, Operational Test and Evaluation
ETDS	Enhanced Target Delivery System
EVMS	Earned Value Management System
FMA	Foreign Military Acquisition
FTS	Flight Termination System
G&C	Guidance and Control
GFE	Government Furnished Equipment
GFP	Government Furnished Property
GMD	Ground-Based Midcourse Defense

GS	General Schedule
ICBM	Intercontinental Ballistic Missile
IEU	Integrated Electronics Unit
INF	Intermediate-range Nuclear Force
IRBM	Intermediate Range Ballistic Missile
IRFNA	Inhibited Red Fuming Nitric Acid
JROC	Joint Requirements Oversight Council
km	kilometer
KPP	Critical Performance Parameters
LFT&E	Live Fire Test and Evaluation
LRTPO	Long Range Targets Project Office
MAA	Mission Area Analysis
MAISAPS	Major Automated Information System Acquisition Programs
MBRV-3	Modified Ballistic Reentry Vehicle 3
MDA	Missile Defense Agency
MDA/TC	Missile Defense Agency Targets and Countermeasures
MDA/TE	Missile Defense Agency Test and Assessment
MDAPS	Major Defense Acquisition Programs
MDSG	Missile Defense Support Group
MDTJPO	Missile Defense Targets Joint Project Office
MK	Mark
MNS	Mission Need Statement
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRL	Mission Requirements Letter
NCU	Nozzle Control Unit
NMD	National Missile Defense
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OSP	Orbital/Sub-orbital Program
OT&E	Operational Test and Evaluation
OTA	Operational Test Agency
PAC-3	PATRIOT Advanced Capability 3
PC	Prime Contractor
PCS	Piledriver Control Section
PDR	Preliminary Design Review
PHI	Photonic Hit Indicator
PM	Program Manager

PMA	Program Management Agreements
PPBS	Planning, Programming, and Budgeting System
PDR	Preliminary Design Review
RCS	Radar Cross Section
RGU	Rate Gyro Unit
RSS	
S/MRTPO	Short/Medium Range Targets Product Office
SDI	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SEC	Senior Executive Council
SEP	Systems Engineering Process
SLBM	Sub-marine Launched Ballistic Missile
SM-2	Standard Missile 2
SMC	U.S. Air Force Space and Missile Systems Center
SMD C	U.S. Army Space and Missile Defense Command
SNL	Sandia National Laboratories
SOW	Statement of Work
SRBM	Short Range Ballistic Missile
STAR	System Threat Assessment Report
STARS	Strategic Target System
START	Strategic Arms Reduction Treaty
STPO	Strategic Targets Product Office
T&E	Test and Evaluation
T/O	Task Order
TCC	Target Critical Characteristic
TDP	Target Development Plan
TEMP	Test and Evaluation Master Plan
THAAD	Theater High Altitude Area Defense
TLV	Target Launch Vehicle
TMD	Theater Missile Defense
TOEB	Task Order Evaluation Board
TPB	Target Program Baseline
TRCWG	Target Requirements Certification Working Group
TRD	Technical Requirements Document
TSC	Telemetry Signal Conditioner
TSP	Target Support Plan
TSRD	Target System Requirements Document
TT	Thrust Termination
TTPO	Theater Targets Product Office
U.S.	United States
UDMH	Unsymmetrical Dimethylhydrazine
UDS	Universal Documentation System

UGCS	Unitary Guidance and Control
USASMDC	U.S. Army Space and Missile Defense Command
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
VV&A	Validation, Verification, and Accreditation
WIPT	Working Integrated Product Team



## APPENDIX B. QUESTIONNAIRE

The objective of this questionnaire is to identify management problems experienced since 1990 by current and former Product Managers and Project Managers in the acquisition of ballistic missile targets.

Thank you in advance for taking time to complete this questionnaire, your inputs are invaluable to me as I work on my thesis project.

1. Identify the Product Office/Project Office and the start and end dates that you served as Product Manager and/or Project Manager.
2. Describe your management style (e.g., management by consensus, exception, objectives, participation, walking around, etc).
3. Describe the Targets Office (e.g., Targets Test and Evaluation, Ballistic Missile Targets Joint Project Office, Missile Defense Targets Joint Project Office) organizational structure (include a wiring diagram of the organization, if possible) in place when you assumed command as Product Manager and/or Project Manager.
  - a. Describe any changes to the Targets Office organization made during your assignment as Product Manager and/or Project Manager and how they impacted the Targets Program?
  - b. Did *you* make any organizational structure changes during your assignment as Product Manager and/or Project Manager?
  - c. Did *you* experience any personnel problems (e.g., in general, prior to organizational change(s), and/or as a result of an organizational change)?
  - d. Were Product Office personnel properly trained (e.g., in general, prior to organizational change(s), and/or as a result of an organizational change)?
4. Describe the acquisition process (e.g., from requirements definition to ballistic missile target delivery at a test Range) in place when you assumed command as Product Manager and/or Project Manager.
5. Describe your management interaction with the key processes described above.
6. Describe the significant management problems *you* experienced as the Product Manager and/or Project Manager (e.g., from requirements definition to ballistic missile target delivery at a test Range).

7. Describe how these problems affected your team's ability to deliver ballistic missile targets that meet/met your customer's requirements (e.g., performance, cost, schedule, etc).
8. In your opinion, which management problem(s) were/are the most significant?
9. Describe changes that were implemented to address the management problems identified above.
  - a. Were the changes effective? Why? Why not?
  - b. Describe additional problems, if any, that resulted from the changes that were implemented.
10. Summarize the ballistic missile target acquisition process in place at the end of your assignment as Product Manager and/or Project Manager.
11. Were the changes to the ballistic missile target acquisition process directed by you as Product Manager and/or Project Manager, or were they directed by some other government agency?
12. What were/are the key lessons learned during your assignment as Product Manager and/or Project Manager?

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