

MASTER OF SCIENCE IN PROGRAM MANAGEMENT

A UNIQUE PROTOTYPING CONCEPT FOR MISSILE AND AVIATION WEAPON SYSTEMS

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This thesis is a case study into the development of a unique prototyping concept to support aviation and missile weapon system requirements. The U.S. Army Aviation and Missile Command has an electrical and mechanical prototyping capability that has existed for twenty-five years, but has been geographically, and functionally separated. These capabilities have been integrated both functionally and geographically into the Prototype Integration Facility, Building 5405, at Redstone Arsenal, Alabama. Aviation and missile program managers are faced with the increased challenge to acquire materiel in a more cost effective, timely manner. The Prototype Integration Facility (PIF) concept builds off the foundation of the existing base of prototyping experience, but integrates unique business principles to form a creative, powerful concept to assist aviation and missile program managers in their quest to rapidly provide materiel to the warfighter. The primary tenants of the PIF concept include the leveraging of existing Governmental and industrial capabilities to provide a cost effective alternative for program managers to utilize. The PIF concept utilizes a ten-year, \$1.1 billion contract, to leverage the capabilities of original equipment manufacturers, capability-specific companies and small businesses. Since implementation of the PIF concept in June 2002, an influx of \$18 million of aviation and missile prototyping business has been achieved.

KEYWORDS: Missile Prototyping, Aviation Prototyping, Alternative Acquisition Processes, Aviation Modifications

A PROGRAM MANAGER'S GUIDE FOR SOFTWARE COST ESTIMATING

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This thesis will assist current and future program managers by outlining a process to ensure the software cost estimates developed for a system will be credible and supportable throughout the life of the program. This thesis also identifies many of the problems associated with software cost estimating and recommends potential solutions.

One of the critical parameters for estimating software cost is the quantity of source lines of code (SLOC) required in the program. Therefore, this thesis examines the software cost implications of improperly estimating SLOC and function points. Some of the other parameters required to estimate the software cost include language, functionality, application, software processes maturity, programmer skill level, design and reuse, productivity factors, complexity, utilization and schedules. Many of these parameters overlap. For example, both the complexity of the code and skill level of the programmer directly impacts the productivity and schedule of the program.

This thesis provides a broad view of the software cost estimating process. In the reference and appendix section, a list of valuable resources including commercial estimating models is provided for further assistance.

KEYWORDS: Software, Cost, Estimating, SLOC, Management, Development, Code, Metric

PROGRAM MANAGEMENT

ACQUISITION OF THREAT-REPRESENTATIVE BALLISTIC MISSILE TARGETS

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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 lessons learned provided by experienced Product Managers and Project Managers.

KEYWORDS: Program Management, Ballistic Missile Targets, Consolidated Targets Plan, Missile Defense Targets Joint Project Office, Target Development Process

CASE STUDY OF THE DEVELOPMENT OF THE APACHE ATTACK HELICOPTER (AH-64)

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This research examines advances in aviation technologies that allowed the Apache to become the world's premier attack helicopter. This is one of a series of research pieces, conducted under the auspices of an ongoing research effort sponsored by Headquarters U.S. Army Material Command. The U.S. Army Aviation and Missile Command (AMCOM) has contracted with the University of Alabama in Huntsville (UAH) to do this research. After all of the research is completed, the principal investigators at UAH and Massachusetts Institute of Technology (MIT) will do a crosscutting analysis across all the systems to identify key factors that can be used to guide future decision-making. This thesis presents answers to a structured set of questions that address issues concerning outside influences, technology maturity and program management. It evaluates the role of development and test strategies, and whether these have helped to create a functional system. The research methodology is a Case Study, a limited number of questionnaires were sent to key personnel intimately involved with the program development. This thesis provides the reader with a thorough understanding of how the history of Army aviation has evolved, leading to the requirement for an attack helicopter on the modern battlefield. The emphasis of this document is to follow a major weapon system through its lifecycle, leading to successful deployment. Lessons learned are presented in a clear concise manner addressing issues of prime concern to any size program.

KEYWORDS: Acquisition, Apache, Aviation, Funding, Helicopter, Program Management, Requirements, Test and Evaluation, Technology Readiness Levels, TRADOC

PROGRAM MANAGEMENT

CONTRACTING FOR LIFE-CYCLE CONTRACTOR SUPPORT FOR ARMY TACTICAL MISSILE SYSTEMS

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Government interest has increased in recent years regarding the viability of contracting out for the Life-Cycle Support of military weapon systems. This thesis addresses the legal ramifications and possible contracting avenues that Program Managers could use to obtain support for Army tactical missile systems. Congress has enacted numerous statutes that the Program Manager must adhere to regarding depot maintenance activities when considering Life-Cycle Contractor Support.

Within the Program Executive Office (PEO), Tactical Missiles, two programs have received approval for contracting out support efforts. One program awarded a contract in 2000 and the second is in the planning stages. The potential exists for numerous programs to pursue this avenue for supporting DoD weapon systems.

KEYWORDS: Life-Cycle Contractor Support, LCCS, Award Term Contract, Warranty, Cost-Plus, Fixed-price, Incentive Fee, Award Fee, Statutory Requirements, Depot Maintenance, Tactical Missiles, Javelin, Improved Target Acquisition System, ITAS, Supportability

AN ANALYSIS OF ARMY PROGRAM MANAGEMENT OFFICE INSERTION INTO THE CENTRAL TEST AND EVALUATION INVESTMENT PROGRAM PROJECT SELECTION PROCESS

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The Central Test and Evaluation Investment Program (CTEIP) was established in 1990 by the Office of the Secretary of Defense (OSD), in response to Congressional direction, to provide a corporate investment approach to meeting Service and Defense Agency Test and Evaluation (T&E) needs. This approach to the allocation of test resources increases interoperability between the Services, and interconnectivity among the test centers and ranges. It serves to focus T&E expertise on test requirements that are of the highest priority. The CTEIP project selection process consists of a cyclic approach in which the Services and Defense Agencies solicit T&E needs, propose solutions to those needs, and then formally project proposals. Program Management Offices (PMOs) are not directly solicited for potential project solutions addressing direct operational test needs, yet, the PMOs are facing significantly reduced T&E funding. Knowledge of the CTEIP program and the proposal submission process should aid the PMOs in the planning and execution of their Operational Test Programs. This thesis reviews the CTEIP and evaluates the extent to which PMOs are involved in the submission of T&E needs, and the value of PMO involvement in CTEIP project selection process.

KEYWORDS: Test and Evaluation, T&E, CTEIP, T&E Investments, Program Management Office, PMO, TEMA, DOT&E, Funding, Operational Testing, Requirements, Test Needs, T&E Planning

PROGRAM MANAGEMENT

THE ANALYSIS OF SIMULATION BASED ACQUISITION (SBA) ECONOMIC BREAKPOINTS IN THE LIFECYCLE OF MAJOR PROGRAMS

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The research area of this thesis is Simulation Based Acquisition (SBA) and the methods in which it has been implemented into the Department of Defense (DoD). Application of SBA initiatives relies upon the use of modeling and simulation, among other methods, to effectively use scarce resources – funds, manpower, equipment – in the life cycle of major programs. The SBA initiative has been used in the Department of Defense for approximately six years. Accordingly, program managers have employed the techniques of SBA to achieve significant advances while reducing costs. Thus, those resources saved may be used elsewhere in the program. Typically, savings can be realized early in the program life in terms of downstream logistics. Users who have identified Operating and Sustainment (O&S) constraints during the preparation of the Mission Needs Statement should examine the inclusion of SBA during concept exploration and system development. The Department of Defense has provided guidance on the SBA initiative and the methods of SBA are being incorporated into programs. The attempt of this study will not only identify the key points within the program to use SBA, but also how to best employ those methods.

KEYWORDS: Simulation Based Acquisition, Modeling and Simulation, Acquisition Life Cycle, Program Management, DoD Directives

PRIME VENDOR SUPPORT (PVS) FOR THE AVENGER M3P .50 CALIBER MACHINE GUN SYSTEM

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The United States Department of Defense (DoD) is under pressure to improve the way it does business in order to save money, improve performance, and improve customer satisfaction. Numerous plans and declarations have been initiated in the past, only to be overcome by business as usual. In 1994, Secretary of Defense William Perry initiated Acquisition Reform policies, causing sweeping changes in many areas of acquisition that continue to evolve today. Reform has brought about changes in program planning, specifications, requirements, test and evaluation, systems engineering, and documentation. One area in DoD that has been a challenge for significant change is logistics. It is widely publicized that at least 60 percent of the life-cycle cost of a weapon system is in the years of sustainment after the development and production are complete. With very few new systems in development, ways to improve the reliability and lower the support costs of our legacy equipment must be found. Many pilot programs are now in place and are slowly starting to reap benefits. One program that has received recent attention is Prime Vendor Support (PVS). This thesis will examine the feasibility of Prime Vendor Support (PVS) for the M3P machine gun, a major subsystem of the Avenger air defense platform. Research will include a review of the current M3P support concept, an in-depth study of PVS and examples of where PVS is being implemented, and the advantages and disadvantages of support through PVS.

KEYWORDS: Logistics, Prime Vendor Support (PVS), Contractor Logistics Support (CLS), Avenger, Air Defense, Small Arms, Machine Gun

PROGRAM MANAGEMENT

CASE STUDY OF THE DEVELOPMENT OF THE TARGET ACQUISITION DESIGNATION SYSTEM / PILOT NIGHT VISION SYSTEM (TADS/PNVS)

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This thesis is a case study of the extent to which a series of factors influenced development of the U.S. Army Target Acquisition Designation System/Pilot Night Vision System (TADS/PNVS). This study is one of a series being prepared under an ongoing research effort sponsored by Headquarters U.S. Army Material Command (AMC). These studies will look at various weapon systems that participated in Operation Desert Storm (ODS) and will study the effectiveness of their Development Strategies, for the purpose of later comparing system effectiveness in ODS. The TADS/PNVS was developed for the AH-64A Apache Helicopter, as a sighting system for the Hellfire missile system. This case study focuses on the system's three critical technologies, evaluates their technical maturity at various stages versus Technology Readiness Levels, and analyzes how that affected the later development and testing. The study also highlights funding stability, user involvement, integrated product teams, and testing strategies. The thesis focuses particular attention on testing, and whether testing of the TADS/PNVS system was sufficient and timely during development.

KEYWORDS: Acquisition, AH-64, AMC, AMCOM, Bore Sight, Development, IPT, LOSS, Night Vision, ODS, PM, PMO, PNVS, Program Management, Stabilization, TADS, Test, TRADOC, TRL

MANAGEMENT OF MICROCIRCUIT OBSOLESCENCE IN A PRE-PRODUCTION ACAT-ID MISSILE

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Microelectronic piece-part component obsolescence problems are prevalent and costly across all Department of Defense (DoD) weapon systems, both new and legacy. The issue is driven by the high turnover in electronic components, limited DoD influence upon component manufacturers, poor obsolescence management at both Program Office and Command levels, and a lack of understanding of the analysis tools and design techniques available to the Program Manager (PM) to help mitigate problems. The issue of microcircuit obsolescence affecting a pre-production, Acquisition Category (ACAT)-ID, Missile program is of particular interest due to their inability to transition from pre-production into full rate production, without a major redesign due to microcircuit obsolescence. The DoD and other governmental agencies, along with commercial industries, are investigating numerous ways to reduce the increasing costs associated with obsolescence. This thesis incorporates this information to provide both the pre-production ACAT-ID Missile Weapon System Program Managers and the U.S. Army Aviation and Missile Command (AMCOM) guidance in addressing microcircuit obsolescence challenges from a management perspective.

KEYWORDS: Obsolescence, Missile, Management, Components, Piece-parts