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This thesis describes and discusses the functions, responsibilities and interfaces of program managers working in System Program Offices in the Aeronautical Systems Division (AFSC). It emphasizes information that will be useful to young officers being assigned as program managers for the first time. It includes sections on the Systems Acquisition process including documents and the program life cycle phases, the System Program Office (SPO), and Program Management. There are major sections discussing the Program Manager, interfaces, planning and controlling, and the Government-Contractor relationship. Also included are sections discussing the SPO functional elements (Procurement, Test and Evaluation, Configuration, Integrated Logistics Support, Manufacturing and Production Management, Program Control and Engineering) with emphasis on information germain to program managers. Many sections contain a list of references related to the section topic. The final section consists of a review of personal interviews of 30 ASD program managers. Information obtained from these interviews includes necessary knowledge for new program managers and the most time-consuming and the most important program management tasks.

AERONAUTICAL SYSTEMS DIVISION (AFSC)
PROGRAM MANAGEMENT RESOURCE DOCUMENT

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirement for the

Degree of Master of Science in Systems Management

By

Gregory M. Postulka, BS
First Lieutenant, USAF

September 1981

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COMMITTEE CHAIRMAN

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CHAPTER 1

THESIS INTRODUCTION

Introduction and Background

The purpose of system acquisition management is to provide centralized management authority over all of the technical and business aspects of a program (25:2). Systems acquisition is a process that is described by the sequence of acquisition activities starting from the USAF's reconciliation of its missions needs, with its capabilities, priorities and resources, and extending through the introduction of a system into operational use or the otherwise successful achievement of program objectives (26:7). Program objectives are the cost, schedule, and performance goals being sought by the system acquisition program in response to a mission need (26:7). System is the term used to acknowledge all the elements which comprise the weapon system, including the mission equipment (airplane, missile, etc.) and its support equipment, supplies, and spares, training equipment, manuals and technical orders, etc. (25:2).

Air Force Systems Command (AFSC) is responsible for virtually all USAF weapon systems acquisition. This responsibility is delegated to major product divisions: Aeronautical Systems Division (ASD), Electronic Systems Division (ESD),

Space Division (SD), and Armament Division (AD). The System Program Office (SPO), directed by the System Program Director (SPD), is the organization within the product divisions that is responsible for the management of weapon systems acquisition.

A fundamental Department of Defense (DoD) policy is that weapon systems acquisition will be directed by responsible managers under the concept of program management. The concept of program management is analogous to the purpose of systems acquisition management: to provide centralized management authority over all the technical and business aspects of a program.

Under the concept of ASD program management, a program or project (weapon system or subsystem) is managed by a Program/Project Manager (PM). The PM is any ASD individual whose primary function is managing a program or project, including the eight ASD major program deputies (Reconnaissance and Electronic Warfare Systems, Tactical Systems, Airlift and Trainer Systems, Aeronautical Equipment, Propulsion, F-16, Strategic Systems, and Simulators), Systems Program Directors, and chiefs of projects directorates. The thesis product will concentrate on the PMs who work in the various program offices for the above mentioned managers and are closest to the particular program and its daily management. These individuals do not have the added responsibility of running an organization as do deputies and System Program Directors.

The PM's role is to tie together, manage, and direct the development and production of a system to meet performance, schedule, and cost objectives which are defined by the USAF and approved by the Secretary of Defense (5:2). The PM works within the SPO and usually is directly responsible to a Projects Division/Directorate Chief/Deputy or the SPD. The PM is delegated the authority by the SPD from AFSC through ASD and has the responsibility for the daily management of the program (3:A1-1, A1-3). The actual development and production of a weapon system is accomplished by USAF contractors. Thus, the primary responsibility of the PM is to ensure program objectives are accomplished through successful completion of the USAF contract (3:A1-1, A1-3).

Problem Statement

Several ASD PM's have expressed the need for a program management resource document that will help prepare officers with little or no PM and/or SPO background to learn and conduct the program management function within the SPO (6,9,20,28). For example, ASD's Maverick Missile System Program Office has acquired a number of inexperienced managers. According to the Maverick SPO history, in the period from May 1978 to September 1980, eight new PM's began work in the Maverick SPO. Of the eight, only one had previous SPO PM experience, although not in ASD, one other had non-ASD SPO

experience, but no PM experience, and the remaining six had no PM or SPO experience. In the 10 years prior to 1978, the Maverick SPO had about twice as many PMs; all had prior SPO experience and most had previous PM experience. This PM experience trend reversal is currently the rule rather than the exception in ASD (9,19).

Further, other ASD PMs have said that a PM resource document intended to help inexperienced managers would also serve as a continuous source of information and a central reference for experienced PMs.

There is no document that applies to the current ASD organization. A major ASD reorganization was accomplished 15 April 1980. There is also subsequent reorganization currently being accomplished (6,19). ASD reorganized to take greater advantage of the matrix type organization in which they could more efficiently use their manpower resources (19) (32:12). The new matrix organization affects the intra-ASD interfaces of which the PM is part. Since the matrix takes most of the functional specialists (budget analysts, contract negotiators, etc.) out of the SPO, program proximity and loyalty is changed (19,28).

The AFSC and ASD-800 series and the 5000-series DOD Directives do not adequately address what the ASD PM is supposed to do in conducting the job because these documents merely describe system acquisition management in the general terms of planning, organizing, directing, and controlling.

Objective

The objective of this thesis was to develop an ASD Program Management Resource Document. This document was developed to assist SPO Program Managers in learning and conducting their job in the pursuit of successfully accomplishing program objectives. Also, this document was developed to serve as a central reference for further information.

The thesis product discusses and describes the ASD PM function. It furnishes information on the evolution of a program, and includes important PM function elements along with management information on how the job should be done.

Scope and Limitations

This thesis is limited to describing the program management function as it applies to SPOs in ASD. The thesis product is intended to be a reference of general nature to be used by PMs as an aid to learning and performing ASD program management. It is not intended to provide specific "how-to" examples from any organization unless they are used as the best method of definition. Also, it is not intended for use by other AFSC product divisions (ESD, SD, and AD), but because of their similarity with ASD, this resource document may be modified for use in these or other organizations with similar structure and purpose.

This resource document is not intended to provide detailed policy or procedural information concerning the overall USAF acquisition management and supporting functional management processes. This information is contained in other publications and will be referenced throught the document. Finally, it is not intended to be all encompassing, nor does it replace other publications governing acquisition management. Rather, its purpose is to supplement the basic documents describing the standard procedures with information which will aid program managers in performing their job.

Methodology

A literature review was conducted to identify the pertinent Department of Defense, USAF, Air Force Systems Command, and Aeronautical Systems Division regulations, manuals, pamphlets, and military standards. The information in these documents was augmented by various professional and technical articles and research that provide guidance on program management. All documentation and guidance was evaluated with respect to its adequacy and applicability to the stated objective. The evaluation was made (1) with respect to the level that the literature (regulations, documents, reports, etc.) emphasizes a particular topic or concept and (2) with respect to the level of importance that experienced ASD PMs put on a subject.

Also, personal interviews were conducted to gather additional information on basic concepts, special interest topics, and areas of emphasis within ASD. The interviews were conducted with SPDs and PMs who by nature of their positions are knowledgeable in conducting the ASD program management function. The interviews were conducted with 4 SPDs and 26 PMs in 7 of 8 ASD deputates. The information gathered was used in the evaluation, determination of, and support for the contents of this thesis product.

Based on the above sources, a comprehensive set of key program management functions are described with emphasis being placed on those functions that were determined (by experienced ASD PMs and literature emphasis) to be most important and/or recurring. The resource document is a compilation of the set of key program management functions applicable within ASD.

2

AERONAUTICAL SYSTEMS DIVISION (AFSC)
PROGRAM MANAGEMENT RESOURCE DOCUMENT

INTRODUCTION

This document is intended to acquaint inexperienced Program Managers (PM) with certain requirements of current program management directives, to provide information regarding the various processes, procedures, and techniques involved in program management, and to emphasize the necessity of early consideration of many procedural areas of program management.

This document provides an orientation and ready reference capability. It was written to promote a greater understanding of program management and promote effective program management.

It is not intended to be all-encompassing, nor does it replace other publications governing acquisition management. Rather, its purpose is to supplement the basic documents describing the so-called "standard" procedures with information which will aid the PM in adapting, modifying, and applying them to meet the peculiarities of the program.

DIRECTIONS TO THE USER

Do not be alarmed or discouraged by the number of pages; this is not another regulation. This document is designed to give the new, inexperienced Program Manager at the lower levels of management an awareness for the functions, responsibilities, and interfaces that he will face daily. This document does not have to be read cover-to-cover to be useful. Use all of it or part of it in good health and good management.

The first section covers the concept of Systems Acquisition Management, including the important documents and the program life cycle phases and milestones. The next sections briefly describe the System Program Office and Program Management in general. These three sections are, in effect, the "big picture".

The next four sections get into the "meat and potatoes" of this document. The first is an overview of Interfaces -- the art of working and communicationg with others; the second covers the Program Manager in detail; the third discusses the broad, but necessary topics of Planning and Controlling; the fourth describes the very important life of Government-Contractor Interface.

The remaining sections of this document describe all of the SPO functional elements with emphasis on what the PM should know about each.

Following most of the sections, are the references associated with that topic. The references will give you more detailed information and are the standard guidelines.

Also included is a glossary of terms that you will hear or use as a Program Manager.

SYSTEM ACQUISITION MANAGEMENT

The weapon systems required to perform the USAF mission are acquired through systems acquisition management. The acquisition of major weapon systems is one of the most crucial and expensive activities performed to meet national needs. Systems acquisition management and the acquisition process are integrated into the total USAF management process (7:179).

Definition. The sequence of acquisition activities starting from the USAF's reconciliation of its mission needs with its capabilities, priorities, and resources, and extending through the introduction of a system into operational use or the otherwise successful achievement of program objectives is a truly corporate process. It extends from the USAF operating and acquisition commands through USAF Headquarters (HQ/USAF) and the Secretary of the Air Force to the Office of the Secretary of Defense (OSD) and extending finally to the President and Congress. The process is complex and filled with checks and balances. It is sometimes cumbersome and confusing, but it insures that any new major weapon systems are thoroughly reviewed and that they fit into the total defense picture (7:179).

The Office of Management and Budget (OMB) provides acquisition policy for major system acquisitions to all executive branch agencies through OMB Circular A-109. OSD

implements this policy through DOD Directive (DODD) 5000.1 Major System Acquisition, and DODD 5000.2, Major System Acquisition Process. The USAF, in turn, implements the DOD Directive through Air Force Regulation (AFR) 800-2, Acquisition Program Management, and AFR 57-1, Statement of Operational Need. HQ USAF and the implementing, supporting, and using commands provide additional guidance and direction. However, all guidance and regulations refer to the system acquisition program, the basic unit addressed here (7:179).

An acquisition program is a defined effort funded by Research, Development, Test, and Evaluation (RDT&E), and/or procurement appropriations with the objective of providing a new or improved capability in response to a stated need or deficiency. Programs anticipated to involve costs of $100 million RDT&E or $500 million in production are candidates for designation as major system acquisition programs (7:179).

Concept. The concept of system acquisition management is to provide centralized management authority over all of the technical and business aspects of a program. System acquisition management, as the term implies, is carried out under a "systems" concept (25:2).

A weapon system is more than just the mission equipment (aircraft, missile, radar, etc.). The term system is used for the specific purpose of acknowledging all the elements which comprise a weapon/support system. In addition

to the mission equipment, a weapon/support system includes peculiar support equipment, supplies and spare parts; technical orders and manuals, training and training equipment; etc. Therefore, in a system development, more is being developed and procured than just the mission equipments. All the many peripheral elements must be considered, developed, and procured with the basic mission equipment (25:2).

The system acquisition process is a sequence of specified phases of program activity and decision points directed to the achievement of established program objectives in the acquisition of weapon systems. The process is initiated with the approval of a mission need and extends through successful completion of development, production and deployment of the Defense System or termination of the program (25:2).

Successful management of system acquisition depends upon competent people, defined responsibilities and authority, realistic objectives, rational priorities, and recognition that programs are different and require management flexibility (25:2).

Objectives. The objectives of systems acquisition management are to ensure that each major system fulfills a mission need, operates effectively in its intended environment, and demonstrates a level of performance and reliability that justifies the allocation of limited resources for its acquisition and ownership (26:4).

System acquisition management also ensures appropriate tradeoff among costs, schedules, and performance characteristics, and provides strong checks and balances by ensuring adequate system test and evaluation (26:4).

Overview. The objective of the following five sections is to provide an overview of the system acquisition process, from requirements definition through deployment. Emphasis is placed on the description of the major program reviews, decision points, pertinent directives and contract documents. Those unfamiliar with AFR 800-2 methodology and terminology and those new to system acquisition will find this chapter a useful summary of the overall system acquisition process (11:3.1-3.15).

Documents. The major planning and action documents used in the acquisition process are the Statement of Operational Need (SON); Mission Element Need Statement (MENS); the Decision Coordinating Paper (DCP) or the Program Memorandum (PM); the Program Management Directive (PMD); the Program Management Plan (PMP); the Procurement Plan (PP); and the Request for Proposal (RFP) and contract. Subsequent paragraphs will discuss the purpose of each document.

Statement of Operational Need (SON). The acquisition process starts with the statement of needs. The statement of an operational deficiency or need is expressed by HQ USAF or the major command in the form of a SON. A mission analysis

or other study is usually accomplished to identify new concepts for the system or equipment and provide supporting data for preparing the SON.

Mission Element Need Statement (MENS). The MENS is prepared by HQ USAF and submitted to OSD by the Secretary of the Air Force to support the Milestone Ø decision. It should describe the mission and justify the initiation of the new major system acquisition. Specific items to be included are:

a. State the need in terms of the task to be performed.

b. Assess the project threat.

c. Identify DOD capability to meet the threat.

d. Assess impact of not acquiring the capability.

Decision Coordinating Paper (DCP). The DCP supports DSARC reviews and the Secretary of Defense decision-making process for Milestone Decision I, II, and III. It is prepared by HQ USAF before Milestone I and is updated before each succeeding Milestone Decision. It is the principle document for recording (1) the essential program information including the issues and risks, the alternatives, decision rationale and review thresholds and the phasing of funds, and (2) the Secretary of Defense (SECDEF) decisions. It includes a section on the acquisition strategy, Design to Cost (DTC) goals and Life Cycle Cost (LCC) estimates. The program

manager is responsible for many of the inputs to the DCP and as such the procurement contracting officer is responsible for assisting in preparing the acquisition strategy inputs. This strategy should only be modified if the corresponding technology advancement originally assumed is not borne out during development, or if major changes in program approval are determined necessary.

Program Management Directives (PMD). The PMD is a brief HQ USAF statement of requirements for a new program. A PMD for the conceptual phase will indicate what USAF and Secretarial actions have been completed and what the program manager must accomplish to translate the requirement into a proposal for the new program. USAF specifies DTC and LCC requirements in this document. PMDs will also be provided by USAF for subsequent full-scale development and production and deployment phases as more information becomes available.

Under a memorandum of agreement between HQ AFSC and HQ AFLC, AFLC assumes a review and advisory role in processing of PMDs. HQ AFSC establishes the program priority and issues guidance and direction (AFSC Form 56).

Program Management Plan (PMP). This plan, constructed in parallel with the Procurement Plan (PP), is the principal management baseline document for the program manager and furnished to higher authority for information and such control as may be reserved by higher authority. This plan:

a. Reflects a management approach most appropriate to a peculiar program established to

implement PMDs and AFSC Forms 56.

b. Outlines the total program planning, events, schedules, and resources required for program efforts specified in the PMD and AFSC Forms 56.

c. Serves as the singular baseline management document used by all participating organizations and provides them with essential and current program objectives, requirements and other responsibilities, tasks, and time-phasing actions related to each organization.

d. Contains those sections set forth in AFSCP 800-3, Attachment 3.

Guidance on developing and preparing a PMP is contained in AFSCP 800-3.

Procurement Plan (PP). This plan is the principle long-range procurement planning document which charts the course of major procurement programs. Advanced procurement planning includes consideration of operational requirements, technical objectives, economic factors, use of appropriate contract techniques, and compliance with procurement regulations and policies.

Request for Proposal (RFP) and Contract. RFPs and contracts for the concept exploration phase should specify objectives for production and operating and support costs, or major operating and support cost drivers. They need not specify rigid goals which would prevent optimum tradeoffs between unit cost, performance, quantities desired, and overall affordability.

RFPs and contracts for the validation phase and full-scale development phase should consider a broader range of

more specific factors.

a. Source selection criteria.

b. Production and operating and support cost objectives or the surrogate operating and support cost driver variables such as reliability and maintainability (R&M) requirements.

c. Contractor information on proposed programs to manage production unit cost and operating and support cost or the operating and support cost driver variables.

d. Planned quantities, production rates, and learning curves. Methods for handling changes impacting contractual goals which encourage contractors to submit cost effective changes.

e. Any necessary special tooling, directed subcontracting, or directed or permitted use of Government facilities.

f. Methods for handling the effects of inflation.

g. Contractor data needed to substantiate estimates of production cost and operating and support cost or surrogate operating and support cost driver variables.

h. If the contractor is to prepare operating and support cost estimates or if operating and support cost incentives are planned, certain information must be supplied: mission scenarios, operating concepts, logistics concepts, operating and support cost model to be used, definition of model terms, and contractor and DOD responsibilities for data inputs to the model.

i. Conditions of any planned Reliability Improvement Warranties (RIWs) or Logistics Support Cost Guarantee provisions and description of any incentives and methods of verification.

System Acquisition Summary. Standard system acquisition for major systems is normally divided into four phases (14:4),

(Concept Exploration, Demonstration and Validation, Full-scale Development, and Production and Deployment), with each phase preceded by SECDEF decisions. The emphasis is on decentralized management tailored for each individual program. During the first three phases, the USAF gathers pertinent government/contractor data to make program recommendations. For major programs, it supports a request to the SECDEF to proceed. Secretary approval, constraints and basic information furnished by the System Program Office provide the basic information from which the draft Decision Coordinating Paper (DCP) is prepared. After review by the Defense Systems Acquisition Review Council (DSARC), the SECDEF presents his decision by issuing the formal DCP. If the decision is to continue the program, restraints and management policy are dictated in the DCP.

The USAF requests SECDEF direction with the draft, and the SECDEF directs with the signed DCP. HQ USAF directs with a Program Management Directive (PMD) to the major commands (MAJCOMs). The Program Manager (PM) indicates the integrated time-phased tasks and resources required to complete the task specified in the PMD by his Program Management Plan (PMP).

The implementing command (usually AFSC) and the PM usually operate through a System Program Office (SPO) to manage the system acquisition process.

Program Phases. The following is a detailed look at the System Acquisition Phases.

Concept Exploration. This phase begins with a favorable SECDEF decision at Milestone Ø. Program initiation, i.e., a valid need exists and a major system acquisition (or modification) is required. SECDEF approval is required before commitment of funds for identification of alternatives. Early competitive exploration of alternatives is stressed. Existing military and commercial equipment should be used to fill the need whenever feasible.

Following approval at Milestone Ø the PMD is released which gives program guidance, cites implementing and participating commands, includes program constraints and thresholds. The SPO then produces the Program Management Plan, Procurement Plan, Source Selection Plan, RFP, and eventually contracts.

Contract documents during this phase normally are cost type or fixed price level of effort and contain few firm cost, schedule, or technical requirements. These contracts call for free application of innovations and knowledge for the conceptual description of systems which would satisfy a stated mission. There is little or no hardware involved. As the system definition proceeds, and alternatives are examined and eliminated, early configurations of hardware, usually critical subsystems, are created and tested. Hardware, however, is seldom the most significant product of such contracts. The end item of these contracts is the data which, in the form

of studies, analyses, test results and conceptual drawings and specifications, demonstrates that concepts exist which have a high probability of satisfying the mission at an affordable cost in a reasonable time.

Once the USAF is satisfied that the alternatives have been adequately screened and is ready to proceed, a draft DCP is prepared and submitted.

At OSD, the Under Secretary of Defense, Research and Engineering, USD(R&E), has primary responsibility for review of the draft DCP with the appropriate Assistant Secretaries of Defense prior to the milestone review. DCP approved by SECDEF will identify the limits or conditions that accompany his decision and thresholds of cost, schedule and performance which cannot be changed or violated without his approval.

Demonstration and Validation Phase. During the Demonstration and Validation Phase, which begins with a favorable Milestone I Decision, the program characteristics (cost, schedule, and performance) are validated and refined through extensive analysis, hardware development and prototype testing. The goal is to establish an allocated baseline consisting of firm and realistic system, subsystem and configuration item (CI) performance requirements and other design constraints; supporting technical data; and program data. In other words, in the Validation Phase, performance specifications and supporting data are developed to establish a new "design requirements" baseline, called the allocated baseline, which meets

the program requirements established as a functional baseline in the Concept Exploration Phase. Source selection authority and contracting thresholds to be met are contained in the program DCP which begins the phase. However, as is true after receipt of DCP in all phases, the expenditure of funds cannot be made until HQ USAF issues funding authority via Budget Authorization (BA) and Program Authorization (PA).

During this phase, hardware assumes a much greater importance as a means of verifying and defining design and engineering concepts, risk reduction and tradeoffs. DOD policy requires that models, prototypes, mock-ups and system hardware and testing thereof will be used so that any decision to proceed further is based upon tested performance of system hardware and upon cost data reflective of actual fabrication results. Competition among two or more concepts and contractors is accomplished whenever resources are sufficient. Competition is normally for technical innovations but is also used as the basis for obtaining cost reductions when the item is within the state of the art and relatively low in risk. Competition is particularly important in this phase whenever it will be uneconomical to continue competition into full-scale development. In these cases, the concept and contractor selected will be those that will continue into initial production and, in many cases, will also be the only ones feasible for full production and deployment. Thus, the assessments to be made must address both the suitability of the concepts

and capabilities of the proposed contractors. Testing of operational prototypes is accomplished whenever feasible. When it is not feasible to test complete prototypes, alternatives such as testing prototypes of major subsystems and competitive development of hardware are considered.

The major objectives of this phase are to reduce cost, schedule, and technical risks, to accomplish more detailed planning to resolve or minimize logistics problems, and to prepare formal requirement documents that translate the requirements into a solicitation package for full-scale development. Thus, contracts for the Validation Phase should assure the acquisition of sufficient data rights to allow the Government the use of all development efforts in the succeeding Full-Scale Development Phase. Cost reimbursement type contracts are usually selected based on the consideration of risk and the fact that the contract normally requires "best efforts" only.

The total effort of the Validation Phase is to optimize the system design based on system performance and cost, to specify in the allocated baseline the performance desired to the configuration item level, to leave as little risk as possible for full-scale development and to document all this in the draft DCP to be used for the decision by SECDEF at Milestone II.

Full-Scale Development Phase. The system, including support items, is designed, fabricated, and tested during

this phase. The intended output is, as a minimum, a preproduction system which closely approximates the final products, the documentation necessary to enter the Production and Deployment Phase and test results which meet the requirements.

Direction comes to AFSC in the DCP, the resulting HQ USAF BA and PA. Source selection of a contractor is very important due to the importance and magnitude of the effort and is usually reviewed at a high level. The contract(s) for this phase should take the design and/or product of the Demonstration and Validation Phase and further develop it for operational use with as low a cost in production as possible without unduly sacrificing quality, and with full consideration of life cycle cost. In those cases where Demonstration and Validation Phase activities have lowered the risks to an acceptable level, contracts often consider the inclusion of not-to-exceed option prices for initial production quantities. Alternative approaches include using a provision in the full-scale development contract, which bases a portion of the production contract profit or fee on the degree of success in achieving the program cost goal, and including a profit incentive in the development contract, based on the degree of success in meeting the program cost goals.

The contractor design activity starts from the performance specifications (allocated baseline) and develops detail drawings, interface control drawings, assembly drawings, installation drawings and Part II Product Specifications.

The USAF controls configuration through the Configuration Control Board (CCB) which evaluates and approves/disapproves system and configuration item specification changes.

Design verification reviews are scheduled to assess the status of technical efforts. These verification reviews are extremely significant and are scheduled in the PMP. The Preliminary Design Review (PDR) is conducted prior to commencing with the detailed design process to assure that the approach is feasible and sound from a design, development, test and activation viewpoint. The Critical Design Review (CDR) should be performed prior to the start of system level development test and evaluation to assure that the detail desing adeuately satisfies the requirements contained in the Part I Development Specifications and to allow the PM to formally approve the design of the equipment to be tested. The Production Readiness Review (PRR) is conducted to provide data for USAF management to prepare the draft DCP for the production decision.

The conduct of Development Test and Evaluation (DT&E) by the USAF and contractors under firm direction and control of the USAF is an essential activity during the Full-Scale Development Phase. The USAF team is headed by the PM or his designated representative, but maximum operational command, AFLC, and ATC participation is encouraged. Planning with these organizations and industry is stepped up for the Initial Operational Test and Evaluation (IOT&E) to be conducted by the operating command prior to the production decision. As

qualification tests are completed for each configuration item, subsystem or system, a formal examination is held to verify that the item has achieved the performance specified in its functional or allocated baseline. This examination is called the Functional Configuration Audit (FCA).

During the full-scale development process, emphasis must be place on reducing technical risks and establishing confidence that an item of equipment or a system will function in the intended environment. This concept, which may be called "Fly-Before-You-Buy" is used to provide a balance between development and production that will produce a system with the desired hardware and capability at an acceptable level. The completion of well-organized verification reviews and functional configuration items can fulfill this goal and provides the USAF with sufficient information for the production decision draft DCP.

Production and Deployment Phase. The DCP following production decision provides direction for system production. The production contractor need not be the one used during previous phases, and usually high-level source selection approval is designated in the DCP. The PM maintains his program management responsibilities to produce and deliver an effective and supportable system at a prescribed cost; however, a detailed contract administration is primarily performed by the appropriate Air Force Plant Representative (AFPR) or Defense Contract Administration Services (DCAS) in-

plant representative. Control of the factors of production (manpower, material, and real property facilities), quality, and finished property inventory is required. Development Test and Evaluation may continue during the early Production Phase.

During this phase, fixed price contracts are often used. Whenever feasible, the initial production is a pilot quantity which is used to verify the design and to provide a sound basis for subsequent production. In view of the scale of production contracts for major systems, particular attention must be given to the realism of delivery requirements, warranty provisions and special provisions.

The Physical Configuration Audit (PCA) is a significant production milestone whereby the configuration of an early production unit (usually out of the first lot) is carefully compared to the design and production drawings. The product of the PCA is formal PM's acceptance of the Part II Product Specifications as audited and approved documents which satisfy the contractual obligation. The PCA provides the Production Baseline, is the prerequisite to configuration item acceptance, marks the beginning of formal engineering change control for Class I hardware design changes, and is usually required for the start of Follow-On Operational Test and Evaluation (FOT&E) by the using command.

During the deployment portion of this phase, the system is accepted for operation and maintenance by the using

command. Acceptance by the Operating Command, of the first operating unit established the significant milestone known as "turnover". Program Management Responsibility Transfer (PMRT), another significant program event, is the transfer of all system management, engineering, funding and procurement responsibility from AFSC to AFLC. The date for PMRT is determined by AFSC and AFLC during the full-scale development phase and forwarded to HQ USAF for inclusion in the production PMD. Program Management Responsibility Transfer should occur at the earliest practicable date during the production phase. Significant planning and coordinating between HQ USAF, AFSC, AFLC, and the using command throught the entire acquisition process is required to effect a proper turnover and PMRT. Unless AFSC and AFLC jointly agree or are directed otherwise, AFSC must complete the following milestones prior to PMRT:

1. Development Testing complete.
2. Product Baseline (PCA) established.
3. All update (development) engineering changes on contract.
4. Appropriate AFLC data (drawings, technical orders, etc.) available.

<u>Defense System Acquisition Review Council (DSARC) at Mile-Stone Reviews</u>. The DSARC reviews the draft DCP before SEC-DEF approval/disapproval. DSARC members, per the DSARC charter (Enclosure 1 to DODD 5000.2) are:

1. Defense Acquisition Executive
2. Under Secretary of Defense Research & Engineering
3. Assistant Secretary of Defense (ASD) (Manpower, Reserve Affairs & Logistics)
4. ASD (Comptroller)
5. ASD (Planning and Evaluation)
6. Special Advisor for NATO affairs
7. ASD (International Security Assistance)

Particular items considered by the council at Milestones I, II, and III are listed in Enclosure 2 of DODD 5000.2

Other Program Reviews. All acquisition programs are subject to high level management reviews at various points in the system acquisition process. Major programs must prepare for the DSARC reviews. Both major and small programs are reviewed at HQ USAF and HQ AFSC on a regular basis. Issues of concern include source selection criteria, the effects of incentives, the results of testing, and the evaluation of program cost goal attainment. Three different types of formal reviews below the DSARC level which are concerned with program issues are (1) the Program Assessment Review (PAR), (2) Command Assessment Review (CAR), and (3) the Secretary of the Air Force Program Review (SPR). The PAR briefing is presented by the System Program Director to HQ AFSC, the Air Force Council, the Air Staff Board and to the Secretary and

Chief of Staff of the Air Force. In these final two reviews, the PAR is known as the SPR. The CAR process reviews those AFSC programs not reviewed by the PAR/SPR process and is conducted at HQ AFSC. Specified issues and required presentation formats are contained in AFSCP 800-23.

The System Program Director is responsible for presenting a formal briefing to the Division Commander, Vice Commander, and their staffs. This review is called a Program Management Review (PMR) and follows the same format as the CAR.

Designated AFSC acquisition programs may be considered for a Joint Operational and Technical Review (JOTR) on a scheduled basis. The objectives of the JOTR are to provide the AFSC Commander and the commanders responsible for operating (or using) and supporting the system with a synopsis of the relationships between operational and support concepts, stated system requirements, characteristics of the conceptual design or designs, technical difficulties, and potential life cycle costs. Procedures for these reviews are contained in AFSCR 800-18.

Overview Summary. The procedures included in this section are based upon DODD 5000.1, 5000.2, and AFR 57-1, AFR 800-2. The process is not rigid since OSD/SAF can give latitude in management. Phases may be omitted, run concurrently, or combined in particular instances. It is important to be familiar with the "normal" system acquisition cycle.

Planning, Programming, and Budgeting System (PPBS). The PPBS is the only system used by DOD to accomplish force planning, obtain funds, and execute service programs. PPBS is used by all services in basically the same manner. This system is the primary means of communicating USAF needs to Congress. The key output products of the PPBS are the President's budget and the Five Year Defense Program. Brief descriptions of PPBS are found in AFR 27-9, AFSCR 27-6, and "The Air Force Budget" - a pamphlet issued annually by HQ USAF (30:38).

Five Year Defense Program (FYDP). The FYDP is the current OSD approved program which lists the DOD plans and programs for the next five years (eight years for force levels). It is the official baseline for all approved programs. This program is directive upon the USAF unless changed by OSD. The USAF has three primary methods of initiating changes to the approved FYDP baseline:

a. Briefing to the DSARC which result in issuance of a DCP or Memorandum of Decision.

b. The annual Program Objective Memorandum (POM) process.

c. Submission of the recommended USAF budget which results in Program Budget Decision (PBDs).

When the FYDP baseline changes, the PMD of the affected programs must be modified. This initiates a chain reaction through the MAJCOM which results in revised manage-

ment direction to the SPOs. AFSC Form 56 is the tool used by AFSC to provide new/revised management direction to the SPO. In addition to management directives, HQ USAF issues Program Authorizations to AFSC indicating the quantity of each end item approved for procurement and the associated dollar amount. AFSC, in turn, releases funds by Budget Authorization to the product divisions on AFSC PA/BA allotment Form 115-5. The PA/BA allotment is used by the comptroller at APO level to cite funds for obligation and expeniture.

Program Authorization/Budget Authorization (PA/BA). Program Authorization (PA) is an official HQ USAF document which authorizes the initiation of procurement action for specific effort or quantitative buy of a system or system support equipment within a certain dollar amount that is consistent with the USAF and Financial Program (1:36:1).

Budget Authorization (BA) is an official budgetary document representing a formal notification of the approved financial plan and permits the Accounting and Finance Office to process and record commitments, obligations and expenditures against the specified budget program within the funds available for all program years of an appropriation (1:36:1).

The main difference between a PA and BA is that a PA is a procurement authorization document related to the USAF Material Programs whereas the BA serves as a budget control

document related to the financing of a program within statutory and congressional limitation (1:36:1).

Direction. The normal form of direction is provided in a document entitled the Program Management Directive (PMD). The PMD is normally implemented through release of an AFSC Form 56, "AFSC Program Direction" by HQ AFSC. This form should provide such additional information as the priority, USAF importance category, the management and technical direction, participating organizations, functional direction, etc. If the AFSC Form 56 is not explicit in these areas, the PM should request clarification and amplification from the AFSC Systems Staff Officer (SYSTO). Because so many people are concerned with the program, the PMD usually requires extensive coordination and revision before it is released. Therefore, to get the program started early, the PM frequently receives his initial direction through means other than the formal PMD. Often a message or letter is used to get things moving (2:3-1).

Therefore, ensure that direction is current, accurately reflects the requirement, and that any guidance received has been properly coordinated with all interested activities. Deviations from formal written directions should be made with extreme caution, and written confirmation of any changes should be a way of life (2:3-1).

PROGRAM MANAGEMENT

Definition. Program management consists of the actions involved in developing and producing deliverable end items on time, within the contemplated cost, and with the required performance. Its purpose is to achieve these objectives through functional organizations (5:8). Program management is the assignment of a specific task (program) to a single individual (the program manager) and giving that individual the responsibility to accomplish the task objectives (7:10). The PM's role is one of planning, controlling, and motivating the program team of functional specialists (5:8). It is basically getting work done through people. Communications must be clear, prompt, and comprehensive (5:1). A more comprehensive definition form DOD Directive 5010.14 states that program management is (7:10):

> A concept for the technical and business management of particular systems/projects based on the use of a designed, centralized management authority who is responsible for planning, directing, and controlling the definition, development, and production of a system/project; and for assuring that planning is accomplished by the organizations responsible for the complementary functions of logistics and maintenance support, personnel training, operational testing, activation of deployment. The centralized management authority is supported by functional organizations, which are responsible to the centralized management authority for the execution of specifically assigned system/project tasks.

Systems Acquisition/Program Management References

OMB Circular No. A-109	Major Systems Acquisition
DODD 5000.1	Major Systems Acquisition
DODD 5000.2	Major Systems Acquisition Procedures
AFR 800-2	Acquisition Program Management
AFSCR 800-2	Program Management
AFSCP 800-3	A Guide to Program Management
ASDR 800-22	Acquisition Management Illuminators for System Program Offices
ASDR 23-1	Organizations and Fuctions. ASD
AFSCR 70-2	AFSC Business Strategy Panel
ASDR 800-20	ASD Acquisition Management Panel

SYSTEM PROGRAM OFFICE

Function. A System Program Office (SPO) is an organizational entity that is tasked to design, develop, test, produce, and field a system within defined schedule and funding constraints for the purpose of meeting a national defense operational requirement. The ASD SPO is a team of functional specialists that operate according to prescribed standards and regulations (29:1).

The SPO is headed by the System Program Director (SPD), who reports to a senior officer, rather than to the head of a functional area (18:5).

The SPO supports the program manager and is the single organizational point of contact with the outside organizations participating in the program. SPO personnel may be permanently assigned and work directly for the SPD, co-located under matrix management and work directly for functional managers, or assigned, attached, or loaned for specific tasks or periods &7:189).

Elements. Common to all organizational variations of the SPO are the functions of program control, procurement, integrated logistics support, configuration management, test and evaluation, and manufacturing and production management. The extent to which these functions are performed is each program office is dependent on the size and complexity of the program (7:12).

Projects Group. The existence of a Projects Directorate/ Division in most large ASD programs is a key indicator that the program/project management philosophy is being passed down to individuals charged with the management of subsystems (29:7).

The significant distinguishing characteristics of the PM relate to the nature of the program/project (Project vs Functions) that he manages and to his interrelationships with other parts of the SPO and other organizations (32:2). The program organization, in its broadest sense, becomes the structural and authority framework through which all the program efforts are coordinated and integrated into the common objective. The SPO, however, is not an independent entity; it is part of all DOD and USAF acquisition organizations (8:162)

PROGRAM MANAGER

Introduction. The Program Manager (PM) is the manager assigned the responsibility for a specific weapon system/subsystem/program during any acquisition phase (1:16). The PM addressed usually works in the SPO Project Division/Directorate or similar projects group. He reports to the Projects Chief/Deputy who reports to the SPD. The PM is the USAF's representative in the daily management of the program acquisition (1:2). It is essential that the PM have an understanding of user needs and constraints, familiarity with development principles, and requisite management skills, and experience. Ideally, management skills and experience would include: research and development, operations, engineering, testing, contracting, prototyping and fabrication of complex systems, production, business, budgeting and finance (1:6).

Functions. The PM is the individual charged with the centralized management function. In addition to being manager for the program/project, he must also (7:10):

(1) organize, plan, direct, and control the program, utilizing the advice and recommendations of the participating organization.

(2) tailor the selection and application of management systems to the needs of the program within the constraints specificed in the PMD (Form 56).

(3) make technical and business management decisions within the approved program to accomplish program objectives.

(4) establish the need, scope, costs, and schedule for all program related effor (support equipment

test equipment, spares, etc.)

(5) assess and document the impact of proposed changes which alter approved program objectives.

(6) prepare and issue a program management plan (PMP).

(7) assure adequate communication and coordination among all participating organizations.

(8) maintain a continuous assessment of the program's progress versus requirements.

Communication. The PM accomplishes tasks by getting things done through other people. Well-planned and thought-out decisions are only as effective as the communication process. His task is one of fostering lateral and upward communications (5:50).

The SPD should delegate to the PM the authority necessary to make his work effective. The coordination and communication within the SPO and upward to the SPD is one of the most important links in the organization. The PM has direct daily contact with all functional areas of the SPO and with the user's representatives. The feedback to the SPD and the resulting program visibility will greatly enhance the success of the program (5:51).

Responsibility. The PM is responsible for managing research, development, and production to meet performance or design specifications. He is responsible for control of the schedule and meeting cost objectives. He does whatever is necessary to propel the progress of program elements in achieving the program objective (5:33).

The PM should devote his efforts primarily to the program and not be called on to defend the utility of the program at levels of higher authority (5:35). Military and civilian superiors are responsible for program advocacy to higher authorities (5:35). The PM must pull together many resources and orchestrate the efforts of the SPO, functional elements, the contractor, and other participating organizations to effectively develop, produce, and deploy the weapon system or product (7:19).

The PM does the planning, organizing, coordinating, directing, and controlling of the program. Although the PM is the responsible individual, he does have a large reservoir of functional specialists to assist him; the functions are discussed in later chapters. The PM is the "team leader" of the program (2:1). Probably the most important aspect of the job is to be an effective team leader so that the team functions successfully. Because the PM does not have expertise in all the disciplines required, he will have to rely on the program team of functional specialists to provide the expertise (2:2-1).

The PM assumes responsibility to interface and integrate weapon system subsystems on compatible schedules and within the established funding limitations. He provides the SPD with constant intermediate management of critical supporting systems and subsystems (34:7). This responsibility

includes managing the development, test, acquisition, and integration of subsystems to be included in the total weapon system (34:7).

Through training and experience, the PM usually becomes proficient in scheduling and budgeting techniques, general planning, and getting things done through people; he understands contracting and control, as well as the technology involved. He knows and understands the contract thoroughly. Above all, he has an interest in the objectives of the program and the background to communicate with people working toward these objectives (5:12).

Requirements/Objectives. Throughout the acquisition process, the PM with the other participants seeks to develop and acquire a weapon system that satisfies program objectives. The program must satisfy the stated requirement, or there is little reason to produce it. The broad performance requirements documented in the contract Statement of Work (SOW) must be expanded to include the performance or standard to be met by each subsystem, assembly, and component. The PM and SPO monitor the design and development effort through design reviews and attendance at various demonstrations of prototype and test articles. Approvals at successive milestones during design and development insure that the effort is on track (7:195).

Program manager and SPO involvement ranges from almost "hands-off" management in competitive prototyping to the

the total engagement mode found in full-scale development of a selected new weapon system. The objective in all cases is to insure that the weapon system meets its performance requirements. Understanding the requirement is a major aspect of managing technical achievement. The PM must have a solid feel for the requirements: Why they are important, how they were derived, and the impact of changes on mission accomplishment (7:195).

As each subsystem is considered, the overall system is impacted. As the overall system is considered, an individual subsystem may be found lacking. This design and redesign, development and improvement continue throughout the process. Technical problems develop and are resolved. A product that meets the performance objectives that satisfies the needs is the overall program goal (7:195).

Working Problems. The heart of the matter in both intervention and decision-making is quickness of response, the focusing of collective energies toward the solution of a critical problem. Given the large number of unanticipated barriers to following the original plans, the interdependencies that multiply the impact of any delay and the ever present schedule problems, the PM must be capable of rapid adaptation after normal sequences and procedures are ignored or bypassed (31:219).

Many times a PM cannot wait for a problem to make itself known officially. The PM must anticipate and discover

problems early (31:219). Perhaps the hardest thing that a PM must do is nothing. It takes restraint to see a problem and sit tight while it is resolved by the functional organization (31:-21). An experienced PM knows when to let the other party work through the difficulty and when it is necessary to intervene, urge reinforcements, or suggest a different approach. Intervening too early can be costly and disrupting, and also wasteful of the special capabilities of the contractor or functional groups working the problem (31:221). Staying out for an appropriate amount of time also provides perspective which can be best when one is personally involved in the emotional effort to solve problems (29:221).

Management Techniques. The PM must be prepared to keep abreast of changes in program management techniques, undergo training when necessary and pass this information on to other PMs. He must be able to use these techniques directly, or modify them for application to the program (5:10). No one is in a better position than the PM to know how the program is progressing and what needs to be done; it is up to him to detect weaknesses and take corrective action within his areas of responsibility (5:11). The type of management style used in the SPO should be in consonnance with the three sometimes conflicting forces: (1) those within the PM himself, (2) those within the SPO, and (3) those in the situation (34:34).

Decision-Making. What drives the decision-making process is that decisions are often made with incomplete facts. Decisions

are also made in situations where there are differences of opinion on things still not definitely established (10:7). The PM requires a choice of feasible alternatives -- alternatives which have been studied, and evaluated from every functional viewpoint. The PM's role in this process is to ensure that all the feasible alternatives have been identified for consideration (10:7). Decisions are continually questioned by everyone. The decisions must stand the test of time as new data becomes available, and sometimes must be altered or reversed (32:34).

Risk. Techniques to establish and maintain program balance are the techniques of dealing with risk -- the identification and evaluation of the risks, the selection among alternative risks, and the plan to avoid or reduce risk. Risk means the chance of being unable to obtain what is wanted at the right time or cost. Ultimately, its the selection of the best alternative among the elements of risk -- all things considered (10:8).

Changes. The PM cannot change the key program characteristics specified in the DCP. But his role in the acquisition process makes him the one person who knows best what beneficial tradeoffs are possible during any stage of the program. As a consequence, the PM is charged with ensuring that the responsibile USAF authority (AFSC/ASD) receives the information required to evaluate advantageous tradeoffs as early as possible -- and as often as necessary (10:9).

Balance and Tradeoffs. A way of looking at program balance is to field a system which achieves the right balance of operational effectiveness and total program cost. The PM and the user must continually balance program funds, schedules, and the desired characteristics of subsystem performance. These tradeoff decisions are a continuing process throughout the program as new developments and unexpected difficulties force the objectives to be reconsidered again and again.

It is clear that technical performance (the product) cannot be isolated completely from time and money (the resource). Problems of technical performance, in general, will be manifested as resource problems (10:26).

In managing USAF programs the PM can and does execute tradeoffs throughout the development and production phase. The process involves open communication and dialogue among the PM, SPD, user, and higher USAF echelons (27:25).

Managing changes and making necessary tradeoffs are the most challenging aspects of acquisition management. Program balance, the maintenance of the cost-schedule-performance equation, is foremost in the PM's mind as he meets this challenge. Changes are an inevitable part of the business and come from many sources: technical problems and breakthroughs, schedule problems, cost problems, new threats, changed requirements, over-optimism, and inadequate planning. Whatever their cause, positive management and control must be exercised to maintain program balance (7:197).

On those matters outside the PM's responsibilities he must provide the alternatives, recommendations, and reasoning to the decision-maker. Timeliness and candor in this regard keep the program on track and the PM employed (7:198).

Authority. Program managers perceive themselves as the focal point for the program and they are viewed by others to be in that role. They are held responsible for the success of the program yet others can make changes that impact the program while not sharing the responsibility (24:30). PMDs do not specifically spell out the PM's authority but task AFSC and ASD to establish his authority (34:17).

One of the PM's greatest sources of authority involves the manner in which he builds alliances and instills confidence; with his peers, associates, superiors, subordinates, and other interested parties. The building of alliances supplements any legal authority; it is the process through which the PM can translate disagreement and conflict into influence power to make decisions stand. When it is obvious that he has a strong alliance with superiors, he will not need to rely as much on their formal authority (27:17).

The main show of authority which the PM can wield stems from his own personality and powers of persuasion. Mutual cooperation is the most effective approach to gaining support and cooperation, especially in the long-term. Higher management backing should be used as a reserve force, however, for stubborn work associates (5:12).

Summary. In the final analysis, the PM is responsible for the program while holding functional specialists responsible for specific tasks or objectives. He cannot delegate overall responsibility. He stands in a position to receive credit for successful accomplishments or to accept the responsibility for failure (3:20-11).

INTERFACES

Introduction. The PM operates through the various functional managers and specialists in directing the resources which are involved in effectively conducting a program. Thus he focuses his attention on program goals and serves as the instrument for implementing decisions in terms of the same structure in which they are made -- the system (8:14).

Unlike most managers, the PM is largely dependent on others to get his work done. Although there are functional specialists to assist him in working the program, the real work of the program is performed by personnel who do not report to the PM or SPD but to other managers in various technical, functional, and professional groups scattered throughout ASD and AFSC and, often, the contractor companies as well (31:204).

Participants. The program participants include any individuals or assembly of individuals in the SPO, in ASD, or in an outside organization that has a vested interest in the program affairs (8:161).

Influence. The emphasis is on monitoring and influencing decisions, not "order-giving" and "decision-making" in the usual meaning of those terms. The PM has overwhelmingly more responsibility than he has authority. The groups he deals with not only give their primary loyalties to their functional organizations but they have performance standards that may be inconsistent with the program. The PM's job is to find ways

of making their performance standards consistent with the needs of the program (31:205).

In the ASD matrix organization, the PM must compete with other programs for people and their time because program priorities exist within the functional organizations (31:205). Because the PM is competing for support, he must try to control their organizational participation, as distinct from their technical participation. This means making sure that functional people do such things as giving problems their "proper" weight and context and working problems in the right sequence and at the right time. It is this imbalancing act that takes much of the PM's time (31:208).

The environment of program management places an extraordinary premium on leadership as distinguished from command and on persuasion as distinguished from direction. The environment requires an emphasis on informal authority or influence as distinct from power. This authority has been described as derived in part from the PM's persuasive ability, his rapport with extraorganizational units, and his reputation in resolving opposing viewpoints (32:4).

Adding to the difficulty is the ASD matrix management concept. The PM is still responsible but without the authority and control over the assigned personnel (7:202).

Flexibility. The PM is encouraged to adapt standard techniques to the peculiar requirements of the program. Experienced PMs would remind the new PM that often one must struggle to

obtain the management flexibility he is supposed to be given. The use of judgement and the exercise of flexibility are difficult to achieve in the environment of military program management. The most significant reason for this is that the operation of program management evisions two organizational elements (32:3).

Organization Elements. There is a small, centralized management authority consisting of the PM and the SPO. This office is served by functional organizations which support the centralized authority and which are responsible to it for the execution of assigned tasks. This environment, where the resources for doing the work are largely outside the authority of the PM and SPD, is a natural source of conflict (32:4).

The practical fact is that there are usually several programs competing for the limited resources of the same functional organizations. Those functional elements are also supporting the normal activities of their parent organizations -- the daily, non-program activities. When personnel are not available to support all of the demands, the PM finds less responsiveness than he desires from the functional elements (32:4).

Another aspect of this problem is the tendency of functional specialists to view their discipline as the nucleus of a successful program. Their commitment to their specialty leads them to try to dictate to the program what will or must be done -- as distinguished from advising what should be done.

One of the most difficult concepts to put across to functional specialists is that the PM is responsible for determining what will be done. The functional specialist is responsible for how it is done -- the how being his area of expertise (32:4).

Resources. There is a natural tendency for the functional managers to standardize their operations or efforts. A PM must influence the functional areas to depart from a standard and build something that fits in with the other parts of the program. The PM will have to influence functional managers to take action when these actions increase a functional manager's risk or use his resources at a greater rate than he would otherwise. The potential is great for disagreement between the PM and the SPO functional elements. Because functional resources are shared among programs, questions of priority arise (32:14). The PM's role is to balance this risk over all portions of the program. Therefore, he must have the support of the SPD to move quickly to balance the risk (32:4).

Tradeoffs. A PM operates in a decision-making matrix, where there are continuous problems of tradeoffs between time and cost, design and cost, design and time, technical risk and uncertainty. He does not make these decisions alone, however, the functional team members provide technical assistance and recommendations (32:16).

Authority. The significance of authority under the deliberate program-functional conflict cannot be understated. While the

SPD may have the final, unilateral right to order affairs in the program, it would be unwise for the PM to substitute his view without fully considering the "crystallization of thinking" of the other program participants. The PM will rarely hope to gain and build alliances in his environment by arbitrarily overruling the other managers who contribute to the program (8:239).

Conflict. Program Managers manage programs, and coordinate action, as necessary, among the functional groups within the organization. The functional managers further depend on a "purposeful conflict" between PMs on the one hand, and functional managers on the other hand, as a means of evaluating relative tradeoffs for the cost, schedule, and performance parameters of the program. The SPD expects the PM and the functional managers to resolve daily operating problems among themselves and to bring only major unresolved questions to him (8:165).

Informal Structure. Not visible in terms of documentation anywhere outside the SPO is a subcomplex of formal and informal working structures that in fact make a program a success of a failure. The one key characteristic of informal working elements is that they are primarily based on special expertise rather than position power. Ultimately, their actions usually merge back into the formal structure at the SPD decision-making level. The informal structure which typically involves horizontal subelements is difficult to

identify because it is so dynamic regarding membership and function (34:27).

Formal Structure. Principle formal structures include: (1) Configuration Control Board, (2) Source Selection Committees, (3) System Safety Group, (4) Design Review Teams, (5) Production Readiness Review Teams, and (6) numerous ad hoc panels formally tasked to accomplish some function (34:27).

Specialists. The typical functional specialist that supports a program will have at least one college degree and often an advanced degree. In addition to being well-educated, most of these people will have a reasonable amount of experience. In comparison to the military personnel, the civilians will have more experience and will also tend to be detailed specialists (34:25).

Summary. The PM must rely heavily on a capable team to handle the details of program operations (5:9). Interface between functional managers must take place and the PM plays a significant part in coordinating all the various functions (5:6). The PM is the focal point of all program activities (5:8). Rarely does he find that the activites are limited to his own organization; he usually must work with participants outside the SPO and ASD (8:165).

The key to working with the functional organizations or any participating organizations is an open communication channel among and between all interested parties (34:29).

PLANNING AND CONTROLLING

Introduction. The activity which has the most far reaching effect on the program is the extent, detail, and realism of program plans. Most of the problems which develop on a program can be traced back to faulty planning in scheduling, budgeting, contingency planning, forecasting, transition planning, planning for changes, or reports planning. Behind these difficulties usually lies the failure to plan for planning; that is, the omission of determining what plans are needed, when and where (5:9).

Planning/Organizing. The planning and organizing functions are closely related: planning concerns what is to be done and organizing concerns the arrangements for getting it done. Planning for the organizing function requires answers to such questions as: What is to be accomplished? When is the work to be done and where? Who will support the program and do the work? How will the functional and program groups be related (8:160-161)?

Planning/Controlling. Planning and controlling are closely related. They are so closely related that there is a tendency to assume that the system used to control the program determines the kind and detail of planning which should be done. This is wrong. The PM may decide that he does not need a sophisticated, computerized control system (like PERT), but he still needs to lay out the details of what he

is going to have to do (10:33). Another advantage of detailed planning is the knowledge of the program the PM gets by working with the plan (10:34).

Planning.

Schedule. Experienced PMs indicate two basic weaknesses in schedule planning; inadequate consideration of administrative processing time and inadequate provision for contingencies (10:33).

Probably more planning effort is devoted to developing schedules than to any other planning task, since it is the task most obviously needed (5:20). Some of the worst and most common problems of optimistic scheduling are in processing procurement actions. In some cases it takes an unbelievably long time. This can be an area of real concern because dovetailed schedules can be disrupted and it can become impossible to meet the planned commitment of funds (10:34).

The PM cannot simply assume that those responsible for processing something really know how long it will take. Functional managers sometimes underestimate the number and impact of unknown problems. One thing the PM can do is to talk to other PMs and find out what happened to them. Situations have a way of staying much the same and affecting the next PM just as they did the one before (10:34).

When everything has been carefully scheduled and estimates applied at every stage, there is still one problem: It will not work out that way. No matter how careful the

plan is, something will go wrong. There must be slack between schedule milestone events or the program will be behind the whole way. Slack must be kept secret from organizations working to target dates specified in planning documents. Once slack is discovered, it will be used up and there will not be any for when it is really needed (10:34).

Inadequate Planning. Poor budgeting can lead to loss of control due to ineffective budgeting, unrealistic scheduling, and by not organizing for effective action (5:14). The purpose of planning is to assure that the program progresses toward the end objectives of the contract. The objective of planning is always to be ready for any eventuality. Effective planning is both a guideline for normal program operations and a contingency in meeting various crises (5:15).

Contingencies. The initial operations plan is the keystone on which the program's success or failure is based. Planning is a continuous function, however. PMs will find it necessary to review and update program plans frequently, and to build flexibility into their plans. Because of changes in most advanced technology programs, planning for certain contingencies should be standard procedure (5:15-16).

In order to be prepared and to have a basis for considering and planning for these contingencies, the PM needs a forecast of trouble spots based on trend analysis, task operation reviews, knowledge of impending contractor actions.

and other inputs. If performed in an organized way, this analysis will shed light on a number of problems and enable the PM to react to small problems before they become urgent, major, time-consuming ones (5:16).

Over-Planning. Planning can certainly be overdone. Planning to a depth beyond which pertinent information can be obtained is impractical. Planning to a depth for which pertinent information can be obtained but to which action is rarely or never directed is impractical (5:16).

Written Plans. All programs, whatever their length and scope, should have a written plan covering what is going to be done, how, when, by whom, for how many dollars, and what the major foreseeable problems are and how they will be overcome. This documented plan is not so much for the PMs own use as it is a means of communicating the basis for program operations to others. It serves also as a reference to determine whether, as work progresses, intermediate goals may have changed, or schedules slipped, or an overrun may be developing which might not have been detected without a written reference (5:17). The PM should make a periodic review of program planning, perhaps prior to a quarterly review or other pause in normal program operations, in order to review the need for adding or deleting planning tasks, for each of the type plans. A review should occasionally be made of even the basic program structure, such as task breakdown and reporting structure, to keep plans significant and alive (5:20).

Objectives. Planning is coming to grips with the hard details of program execution. It involves the examination and reexamination of anticipated problems and the alternative ways to solve these problems. Coming to grips with these details and evaluating alternative approaches are basic steps in program formulations (10:9).

The main policy objective of defense program planning is to maintain a balance between dollar commitments and program risks (10:11). The techniques for obtaining this balance embraces five interrelated planning activities which are discussed in turn (10:11).

(1) Assess the risk implicit in alternative subsystem and system development concepts. Avoid alternatives involving low probabilities of success. Reassess risks periodically during the development program.

(2) Reduce concurrency in risky situations to the maximum extent possible.

(3) Demonstrate mastery of high risk elements before proceeding into successive program phases.

(4) Concentration of effort early in high risk areas.

(5) Program scheduling so that uncertainties are resolved before putting resources into easy parts of the system or into the full program.

Unknowns. Planning for unknowns is the final essential element of program planning. Unknowns come in two varieties: anticipated unknowns and unanticipated unknowns. Planning for anticipated unknowns is the basic substance of risk analysis and plans for orderly risk reduction (10:15).

The possibility of failing to meet a schedule target can be treated by recognizing that some schedule slippage is inevitable. The program must not be so tightly scheduled that a slippage has an unavoidable and devastating effect on related schedules and program costs. Building some slack into the program is absolutely essential (10:15).

Planning for the unanticipated unknowns is conceptually disturbing. The implications for system program plans are obvious: schedule slippages and added, unexpected costs are all but inevitable in later phases -- time and money need to be reserved in each of the major program phases for the time when it will be needed (10:16).

Controlling.

Managerial Control. Managerial controls provide the PM with the tools for determining whether or not the program is proceeding toward its objectives as planned. Controls also advise the PM of the extent of deviations and of the recommended corrective action or alternative course of action. Control has to do with making events conform to plans. It is an organic function of management which facilitates and coordinates the program affairs so that the program objecttives are achieved (8:246).

Planning, organizing, staffing, and directing are steps taken in preparing to execute decisions, whereas control is the step taken in making certain that the decision

is properly executed. Without control, the management job is not complete (8:246).

Control uses information from the past to develop the necessary actions for the future. Since control is forward-looking, any deviations from the standard should be identified and reported to the PM as soon as possible. Control must be established in terms of deviation from the plan early enough so that corrective action can be instituted before progress is impaired (8:246).

Subfunctions. Control consists of several subfunctions necessary for constraining activity. The subfunctions are discussed below (8:247-248):

> Routine Planning. This is the collection, classification, and presentation of the data required for the controlled execution of plans. It involves collecting the data from the program participants and restructuring it into a form that will portray conditions and trends.
>
> Scheduling. This is the specification of dates and times for performing functions and implementing the many subplans of the program. Scheduling, in this context, consists of translating the schedule into actual calendar dates and times.
>
> Comparison. As a subfunction of control, this has to do with the evaluation of completed actions to see how they conform to the plans or standards.
>
> Correcting. Corrective action which follows some form of comparison is concerned with getting the program to conform to the goals which have been set -- cost, schedule, performance. For corrective action to be meaningful, a framework of realistic standards must be established and actual performance measured against these standards.

The PM must evaluate the areas which deviate from the plan. The control system must report exceptions, but it must pinpoint those commitment deviations which, when taken together, provide the greatest threat to the program objectives (8:250).

Program Manager Control Function. Another function of the PM is to achieve unity of communication and coordination across the SPO functional disciplines. He becomes a source of integrated information concerning a particular program and an interaction point for coordinating the diverse organizational and extraorganizational activities involved. This communication function, coupled with the coordinative function, enables him to exercise control over many aspects of the program (8:165).

Control Action. In order to know where, when, why, and what kind of action to take, the PM must consider cost, schedule, and technical factors not only individually, but also their interaction on each other (5:60). The fact that a program has plainly measurable objectives and serves an important purpose as the two basic ingredients in developing SPO personnel into a program team. Keeping these objectives and purpose constantly before SPO personnel is an important function of the PM (5:84).

Change Control. Change control seeks to distinguish the essential from the unessential. It seeks to avoid the

disruptive, and perhaps catastrophic effect of innocent-looking, nice-to-have changes. Change control implies a searching examination of the effect a change may have on cost and schedule objectives before a decision is made. Change control implies that there is no such thing as a technical necessity independent of the cost and time to achieve it (10:40).

Formal changes are issued by the contracting officer only after prescribed reviews and coordination with the SPO. They are not necessarily easy to control, but at least they are easy to identify (10:40).

There are other changes not so easy to identify. Collectively, they are called constructive changes. They amount to the same thing as formal changes except that no one has directly and explicitly addressed their impact on cost and schedule. The government's responsibility for both types of changes is essentially the same. The effect of a constructive change on cost and schedule is not addressed before the change: the government simply pays later when its liability for claims by contractors is the subject then to be addressed (10:40).

Program schedule changes cost money. It costs if the schedule is stretched out, and it costs if the schedule is accelerated (10:41).

Schedule changes are often the result of changes in funding levels. There is little the PM can do to protect the

program against the effect of major budget reallocations The best defense is to make sure that higher authority knows in advance and in as much detail as possible what the consequences of budget changes will be (10:41). The SPD can help achieve budget defense by supporting and advocating the program at higher authority levels.

Cost Control. Cost control is largely a matter of continuing attention and emphasis. The problem is that most of the emphasis is associated with technical performance and schedule objectives In defense weapon system acquisition, the user does not budget or pay for the development. As a result, the user is not especially concerned with cost. What the user wants is the best performance and the earliest delivery. If cost objectives are going to be emphasized in any practical way, it will be only because the PM assumes that responsibility (10:43). Effective cost control can be achieved only by constraining initial program requirements and established requirements must be reexamined in light of new knowledge of the cost implications (10:40).

Budget. A budget is a planned outlay of money by time period. The budget may be portrayed as a plan of cumulative expenditure or as a planned rate of expenditures The PM may determine that both cumulative and rate of expenditures budgets are needed. He needs a cumulative budget, as a minimum in order to maintain constant watch over planned and actual expenditures versus the contract authorized total.

A rate of expenditures budget may be needed also, because the cumulative budget tends to average fluctuations over a period of time; it does not adequately identify when changes in rates of actual expenditures are incompatible with funding limitations (5:21-22). Manpower budgets, both cumulattive and rate of application, may be useful supplements to the dollar budget (5:22).

Accounting and billing procedures are primarily controller rather than program management functions. The elements of control with which the PM is primarily concerned, and without which he will lose control of the program are schedules and actual progress, and budgets and actual costs. But he must also be keenly aware of the status of technical accomplishment, since is has considerable impact on the other elements of control (5:32).

Schedule/Progress. Schedules and progress are basic for program control since limited time is a major characteristic of almost every program (5:32).

A PM who tracks progress can go wrong if schedules are not sufficiently detailed to afford a comparison of actual progress versus plan until it is too late to take timely action. The interrelationship and interdependence of schedules may not be clearly perceived and documented, thereby tending to obscure the causes of slippages. A schedule is only as firm as the attention the PM gives it. When schedules change frequently or where there are doubts about

the "actual" schedule, its validity as a control element is weakened (5:33-34).

Actual progress can be difficult to measure. No single measurement of progress will suffice for all purposes The measure of progress is dependent upon the purpose for which it will be used -- financial, technical performance, or other. Much of the time the PM will be concerned with progress as an element of control versus the schedule and in relation to the budget and costs. It may be difficult to obtain accurate and timely reports of progress (5:35).

In order to control the program, the PM needs to take action when significant deviations in actual costs and progress versus planned costs and progress begin to appear. In spite of practical difficulties in measuring these elements, the PM must gain control of them and pertinent supporting elements (5:42). Program control means, particularly taking action where deviations from plan begin to develop and avoiding anticipated trouble spots (5:43)

Team Meetings. Scheduled program team meetings are a primary planning and control device (32:43). Evidence of the importance of human contact and exchange is the widespread use of meetings by the PM. Some meetings are useful in the hope that face-to-face questioning will dispel doubts and answer nagging worries. Groups get together to seek reassurance that the other people are doing their jobs in a way that will not adversely affect program objectives.

Meetings provide the forum for confrontation and playing devil's advocate which can impart trust and confidence. Meetings also impart a sense of personal participation, of comprehending the situation with one's own senses rather than through intermediaries. Being personally involved and allowed to hear firsthand progress reports, status reviews, and debates concerning alternative approaches demonstrates that one is an accepted member of the team. Meetings also allow for the continuous updating of milestones, plans, and procedures. They are a forum for planning and decision-making. The meetings give the individual functional specialists a chance to express both their concern and anxiety about various aspects of the program (31:222-223).

Cost/Schedule Control System Criteria (C/SCSC). C/SCSC is essentially a specification intended to assure the completeness, accuracy, and integrity of the contractor's systems used to track cost and progress. Government validation of a contractor's system is a process of checking his methods. While a validation gives assurance that the contractor has acceptable methods, it does not establish any specific requirements for reporting cost or progress to the PM. The PM must still establish and define his requirements in terms of what he needs to manage contracted work (10:36).

> Data reported in the C/SCSC must effectively integrate cost and schedule status; provide a clear indication of work accomplished; relate cost/schedule performance directily to work accomplished; summarize directly from contractor's

> internal system; be organized for easy management use; be the minimum amount required to support management needs; be timely, reliable consistent, understandable, complete, and auditable [22:6].

The C/SCSC is one of the latest methods for treating scheduling problems and assuring necessary collaboration between the PM and contracting officer. C/SCSC is not a management system in itself, but is a method for measuring the adequacy of a contractor's management control system. It is applicable to selected contracts within those programs designated as major Defense systems (24:57).

Baseline. The baseline changes frequently as a result of contract changes and internal replanning. Internal replanning does not change the total amount of budget allocated to the contract, but may affect the time-phasing of the effort thus changing the shape of the baseline (22:27).

Changes to the baseline may be caused by rescheduling the work to accomodate changing conditions, moving work or budget from one organization to another, redistributing resources required to accomplish the scheduled work, adding or deleting effort, varying employee skill levels, and other reasons. Such baseline changes must be documented and controlled if meaningful performance measurement is to be accomplished (22:27).

GOVERNMENT-CONTRACTOR INTERFACE

Introduction. The government does not develop and produce any of its systems. The DOD is the largest single customer of the United States industrial complex; the government depends almost exclusively on private industry for the development and acquisition of weapon systems (8:136). The government is the customer working with industry to develop the systems concepts. Traditionally, industry supplies both concepts and systems hardware. A USAF PM will often have to deal with many contractors or with a team of industrial contractors. A contractor for a particular system is selected through competitive procedures, contract terms and conditions are negotiated, and the desired system is then developed, produced, and delivered. Besides ideas, contractors provide guidance on the cost, schedule, and technical feasibility of new concepts. Most major defense contractors have a systems analysis group, which studies the cost-effectiveness relationship of new weapon systems possibilities. From these studies come the proposals for many new weapons. The contractor is a full participating member during all phases of the system (8:185).

Selection. The selection of the major system prime contractor is the single most momentous decision in the management of the program. A bad choice is a curse, a good choice is a blessing, and a mediocre choice means more work for the

PM. Every part of the program is touched by the prime contractor (10:17).

Interface. The contractor is a key player among the program participants. Normally the entire SPO is some way or another interfaces with the contractor. This interface is the major reason for the SPO to exist (34:7). The PM is the leader of the government team and all communications should be coordinated with the PM (24:43). Also, the SPO should have a unified approach to contractor interface (27:46). The PM must manage the contractor, and if all participants do not recognize this, the PM must exercise tighter control (7:198).

The PM and program team (functional specialists) interface with the contractor's personnel to manage the hardware development. Most of the design and engineering effort is performed by the contractor. The SPO has technical expertise but it is used primarily to enhance objective program management and to ensure proper technical interfacing with related programs (33:7).

The largest part of program acquisition funds will be spent through the contractor. Program planning and control activities will be largely dependent on contractor inputs. Some PMs have had very little direct contact with industry. Given the reliance on the contractor's efforts, much of a PM's time and attention will have to be devoted to problems in an environment which may be new to him (10:17).

Knowing the Contractor. If the PM is going to do his job right, he should know the major contractors -- their history, organization, people, and the way they do business. To understand a contractor, the PM must know something about the industry he is a part of -- its growth or decline, and its problems. And to understand an industry, he has to know something about what motivates business in general. Industry goes to great lengths to learn everything it can about its customer -- the USAF. A PM should do no less in learning about his major supplier (10:11).

The kind of information needed includes such things as areas of market interest, the number of suppliers and trends toward concentration, interest in seeking primarily commercial or government work, backlog of commercial and government work, relationships with parent organizations, recent management changes and reasons for the changes, and recent organizational changes. Trade journals are a useful source for this information. The procurement office can furnish additional information. The contract administration people (AFPRO, DCAS) in the field who have cognizance of the contractor's plant can provide insight into recent developments and trends that are part of the intelligence needed to understand a contractor (10:17).

The Market. The weapon system marketplace is not the traditional market for one obvious reason. There is only one

buyer -- the government, however there may be many users, foreign and domestic. There are other differences attributable to there being only one buyer. There are not many sellers of USAF weapon systems. There may be only one seller, or a few at most, for a specific system. These sellers are largely a dedicated industry. That is, they exist primarily to satisfy one buyer's requirements for goods and services which they cannot sell elsewhere. The sellers need the buyer and will compete fiercely for his business; but the buyer also needs the sellers. If the buyer does not conserve his suppliers, he may find no one who can satisfy a present or future requirement. In an important sense, there is a reversal of roles compared with the traditional market. There the sellers attract the buyers; in the weapon system marketplace the buyer attracts the sellers (10:17).

The long-time motivation of contractors is survival. In the long-term, survival requires profit (10:17). If a company must be profitable to survive, it must also survive if it is going to be profitable. If it cannot obtain business, it will not survive (10:19).

Competition. In addition to limited competition at the beginning of a program, there is little chance of obtaining competition of changing contractors once one is selected and the program is underway. The selected contractor quickly acquires people and experience -- and the government acquires

a sunk cost (both money and time) in the people, the experience, and equipment -- that effectively precludes changing contractors (10:17).

USAF Program Manager/Contractor Program Manager. Much has been written about the USAF PM "disengaging" from the contractor -- simply letting him do the contracted work as he wants to do it. The idea is consistent with good management concepts, but the USAF and the PM as its representative has the ultimate responsibility for a successful program. The PM cannot disengage in any literal sense. He must manage contractor management of the program. It is not a question of whether he manages; it is only a question of how he manages -- or mismanages (10:5).

Industry program managers and USAF program managers are agreed on this point (10:15):

> It seems clear that the USAF PM must exercise rather tight control until such time as he is assured that the industry PM has the technical and managerial competence to perform as required. The obverse is equally true, however. Once the USAF PM has obtained the assurance he needs, he should relax his control and allow the contractors a measure of freedom to exercise judgment and flexibility similar to that which he seeks for himself.

Mutual trust must exist between the contractor and the PM and be nurtured with close cooperation on a daily basis. Every successful PM has good relations with the contractor. There must be understanding about which decisions are to be made by whom. Without this understanding the

result will be delayed and confusion as well as increases in cost and time. Another element is essential; personnel in both ASD and contractor program offices should be willing to make decisions as promptly as possible (32:64-67).

Performance Evaluation. The objective of contractor performance evaluation is to assess contractor cost and schedule status, identify cost and schedule problems, insure that the contractor takes corrective action where necessary, and to predict program final cost (18:118). Contractor performance evaluation normally begins with a review of the contractor's internal management system (18:118).

When the government signs a cost or incentive type contract (cost-plus-incentive-fee or fixed-price-incentive-firm), it agrees to reimburse the contractor for costs he incurs, plus a fee or profit dependent on contractor performance. The contractor should possess an internal management system capable of determining the actual costs of a program and also of monitoring and controlling the program's cost and schedule performance, in addition to the technical performance. There is a responsibility on the PM and the SPO to continually assess contractor performance.

The Contract. The contract between the contractor and the USAF is the principal document for all resources expended in the acquisition process (33:7). Knowing the contract is very important. The contract is the primary instrument in

contractor management. It states the product performance requirements, the conditions the contractor must fulfill, and the methods and extent of USAF involvement. It is administered by the Procurement Contracting Office (PCO), the official through which the PM and the USAF manage the contractors efforts. The PM's relations with the contractor are governed by the contract and the contract is governed by the Defense Acquisition Regulation (DAR) and by AFSC and ASD regulations. The PCO is the contractual bridge between the SPO and the contractor (33:14). Documentation of many kinds confirms the contractual decisions made. The USAF, through the Contract Data Requirements List (CDRL), requires the contractor to develop various plans, submit them for USAF approval, then to follow the approved plans in the development process (7:198).

Contract Data Requirements List (CDRL). The CDRL also provides for the regular submittal of reports covering financial status, cost performance, program status, and program progress in various areas such as milestone achievement, testing, and completion of action items. This information documents contractor performance and progress, provides historical data useful in trend projection, and insures that the contractor regularly reviews those areas the USAF thinks are important. The contractor's performance compared to the expected performance (also cost and schedule requirements) reveal unsatisfactory areas that will require attention (7:189).

Communication. Documentation and other written communications are not enough; direct communication with the contractor is a critical part of the management process. This involves visiting the contractor's facility, bringing contractor representatives to the SPO, and using the government personnel (AFPRO and DCAS) at the contractor's facility. Solutions to problems may be worked out faster and more efficiently by telephone calls, visits, face-to-face discussions than by formal proposals and responses. Formal correspondence is necessary since agreements must be documented, but a surprise that comes by mail is normally an indication of poor management. Formal correspondence should be discussed prior to mailing (10:199).

Program reviews, design reviews, and test and training conferences are a few of the formal direct communications available. One-on-one discussions and small group interchanges are useful in resolving both program and management problems. AFPRO and DCAS personnel perform a valuable service to the USAF team, but do not negate the requirement for the PM and other members of the team to get to the center of the action. Over control can be as bad as undercontrol, however. The SPO must communicate the desires of the USAF; the contractor must satisfy these desires. Both must remain within the terms and conditions of the contract (10:199).

A particular firm may be the prime contractor (contract with the government), subcontractor (contract to supply/

support prime), integrating contractor (contract with the government to integrate subsystems), depending on its contractual role in a particular acquisition. The prime contractor is responsible for a weapon system or major subsystem as specified in its contract with the USAF. More than one prime contractor may participate on various pieces of a major system. A single acquisition effort may involve hundreds of firms throughout the United States. Some efforts involve contractors worldwide (7:192).

The USAF and the selected contractor soon become a bilateral monopoly and deal with each other on a bargaining basis. Since the USAF funds the entire effort, it purchases the right to exercise more control than traditional buyers enjoy, but not beyond that agreed to in the contract. The USAF must recognize and respect the management ability and the development expertise of the contractor (10:198).

Interface Relationship. Effective program management requires continual interaction between the contractor and SPO personnel at all levels throughout the acquisition cycle. This interaction needs to be managed daily just like the PM manages any aspect of the program acquisition process. The Government-contractor relationship is a significant aspect of weapons acquisition. Ultimately, the relationship may determine the success or demise of the program (21:228). A proper attitude on the part of the PM and SPO personnel is essential to getting the job done in a manner consistent with

the legal contract. It is their duty to ensure that the USAF gets what it wants, when it wants it, at a fair and reasonable price. At the same time, it is essential to recognize that the contractor deserves and expects a fair and reasonable profit for quality work (30:128). USAF-contractor relationships can be described as extending along a continuum. At one extreme, the relationship may be cooperative, amicable, and perhaps permissive, at the other it may be hostile, legalistic, and marked by distrust. The ideal relationship is probably one that falls in the middle of the continuum. It is the PM's job to create and maintain a good working relationship. If the effort for a good relationship is not made, an adversarial relationship may result (21:228).

Conflict. An adversarial relationship is common when pressures are a result of systems that do not work and cost too much. The PM should prudently protect the Government's interests and expect the contractor's representative to do the same for his company. Conflict is a normal product of such a relationship; however, as one author points out:

> . . . the goal of management is not harmony and cooperation -- it is effective goal attainment! Elimination of conflict is not realistic in complex organizations, nor would such elimination be desirable [21:228].

Adversarial relationships tend to degenerate into mutual distrust and mutual distrust leads to higher program costs. The importance of developing a good relationship has been recognized in one subset of acquisition -- the negotia-

tion process. In regard to the negotiation process, the DAR states:

> Successful negotiation demands that the PM establish and maintain sound, cooperative and mutually respectful relationships with the contractors. Merchandise cannot be sold in an atmosphere of distrust and deception [21:228].

Mutual distrust can lead to more top management involvement in minor decisions. A way that the PM can determine if the conflict between the interested parties has gone bad is if disputes must be continually elevated to higher management. The PM should be able to solve all but the most difficult problems at his level (21:229).

The PM is the key to establishing a healthy relationship with the contractor. He must understand conflict is a natural product of the relationship, and how his reaction to this conflict will determine his success or failure. The PM should protect the Government's interest while showing common sense (21:229).

Changes. The only persons who have the authority to legally commit the Government are contracting officers. However, in the daily working relationship among other SPO personnel and the contractor, many interpretations and judgments are made about the meaning of specifications, and other contractually binding documents (30:129). If a contractor takes actions based on the direction of SPO personnel (including the contracting officer) and the work done by the contractor is

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outside the scope of the contract, the contractor may submit a claim for this "constructive" change order (21:231). Also, the individual directing the action may be personally liable to the Government for constructive changes (30:129).

"Constructive" change orders can consist of letters, telegrams, or other documents written by Government people; however, they can occur simply as a result of casual conversation in which the Government representative may make a comment based on personal desire or preference and the contractor's engineer, interpreting the comment as guidance, accommodates it in the system design (21:231).

With constructive change, the contractor is incurring costs without having agreed to negotiated price -- no one has control over the costs he incurs under this situation (21:231).

Avoiding Changes. Since "constructive" changes are distasteful but can occur quite innocently, how can they be avoided in a complex program? The following measures may not stop "constructive" changes but will help the PM to manage more effectively (21:232).

a. Do not use "constructive" changes to bypass acquisition cycle. The PM should discuss the situation with the contracting officer in order to use the "best" vehicle for implementing a critical change.

b. Establish good correspondence control techniques. The contracting officer should be the last individual to coordinate on correspondence going to the

the contractor in order to analyze it for contractual impacts.

c. Add the following statement or one like it at the end of all letters to the contractor which might affect the work scope. "The direction contained within this letter is construed to be within the scope of the contract. If the contractor disagrees, he will not take action and will notify the contracting officer that he considers the action to be out of scope." Some SPOs have regulations that require this statement to be included in such letters. The contracting division will have more information in this area.

d. Work with the contractor PM and obtain an agreement that his personnel will not act on informal direction. Informal directions only lead to the problem of constructive changes.

All SPO personnel must be extremely careful that the direction given to the contractor is within the terms of the contract specifications lest a "constructive" change order be inadvertantly created (21:232).

Contractor Interface References.

DODI 7000.2	Performance Measurement for Selected Acquisitions
AFSCP 173-3	Cost/Schedule Management of Non-major Contracts
AFSCP 173-5	C/SCSC
AFSCP 800-15	Contractor Cost Data Reporting System
AFP 70-1	Do's and Don't's of Air Force Industry Relations
AFR 30-30	Standards of Conduct

PROCUREMENT

Definition. Procurement is function which brings the Government and a contractor together to satisfy a requirement of mutual interest. A contract is the basic method used by the USAF to procure supplies and services from private business concerns. Contract award and performance are controlled by the Defense Acquisition Regulation (DAR) (formerly the Armed Services Procurement Regulation (ASPR)). The DAR is a comprehensive document governing procurement activity within all DOD agencies (30:49).

Contracting Officer. Everyone within the SPO is concerned with procurement of a system. However, the Contracting Officer (CO) is the only person with authority to enter into and administer contracts for the USAF. Only the CO is warrented with the authority to commit the Government contractually by entering into a contract or changing contract requirements (30:50).

The Procurement Contracting Officer (PCO) is authorized to enter into contracts for supplies or services on behalf of the government by formal advertising, by negotiations, or by coordinated or interdepartmental procurement, and when specially authorized, to administer such contracts in accordance with applicable regulations. As an authorized agent of the government, the PCO must adhere to public laws and the DAR which supplemented by USAF, AFSC, and ASD regulations (12:2-1)

The PCO's fundamental responsibility is to carry out the requirements of law and to follow the procedures of the USAF to serve the "best interests" of the Government (24:1).

The Division. The procurement division is responsible for giving support to the PM for contract planning, solicitation of proposals, negotiation and award of contracts, and the administration of government contracts from inception to completion (12:2-1).

Procurement assists the PM in structuring the contract for a viable contract management position to complete the program, meeting both cost and delivery targets, and to ensure technical performance so that contractors under USAF plant cognizance operate efficiently and effectively and fulfull their contractual commitments (13:70-16).

Request For Proposal (RFP). The RFP is one of the most important documents prepared by the SPO. It provides solicited contact between Government and Industry on a contemplated procurement and is the vehicle by which potential sources are introduced to the job. Further, it sets the stage for the proposals, evaluations, selection, contract definitization (formal acceptance and agreement) and the ensuing justifcations as may be required (1:42-1).

Program Manager Participation. Active participation by the PM is essential and it is important that he has the participation of the functional managers at the outset and follow

through with the subsequent evaluation and contract definization (1:42-1). In the preparation and successful processing of a contract, the cooperation and input of all functional organizations are important and necessary (12:2-1).

Contract Administration Services (CAS). After the PCO executes the contract, it is assigned to a CAS Component, either an AFPRO, or a Defense Contract Administration Services Office (DCASO). Within the CAS activity the Administrative Contracting Officer (ACO) plays a key role. The CAS activity ensures that the contractor does what the term of the contract requires. The AFPRO provides on-site knowledge of what is happening at the plant and provides comments on whether things are going well or need corrective action (24:48). If the PM knows the management system and uses it many people will help him do his job (3:7-1).

Unsatisfactory Performance. Sometimes PMs and functional specialists are hesitant to face decisions necessitated by unsatisfactory performance by the contractor. Many times it is more cost effective to reduce or eliminate contract requirements that are economically unattainable, even if the dollar consideration that can be negotiated is nominal (3:7-1). Everyone should notify the PCO of any delinquencies in contractor performance on a timely basis to effectively enforce the contract terms and conditions (3:7-1).

Program Manager Procurement Function. The PM will have a CO on the program team to help with procurement and contracting

efforts. He will help the PM to initially draw up procurement documents such as Purchase Request (PR), Determination and Findings (D&F), RFP, and the contract which, when signed by both the USAF and the contractor, is a binding document. The PM should never, either verbally or in writing, authorize changes to the contractor or commit the government in any way without the knowledge and approval of the PCO (2:2-2).

The PM has complete responsibility for the successful accomplishment of all matters related to his program. However, he depends on several organizations to assist him in his procurement effort. AFSC division and center staff organizations, such as the Staff Judge Advocate, Procurement, Pricing, Accounting and Finance, external organizations such as CAS activities and the Auditor General combine with the SPO procurement and technical representatives to constitute the contracting team (3:7-1).

The PM and the PCO attempt to determine the right contract for the effort anticipated; one that properly motivates the contractor to give the best effort, yet delivers the required product at the least cost. The contract type is selected and defended along with the expected cost, proposed cost overrun share agreement (shareline), incentives, profits, and fees prior to release of the RFP. The final contract is hammered out at the negotiation table, with the prospective contractor taking an active part. Once signed, the contract dictates what both the USAF and the contractor will do and not do (7:194).

Contract Type/Method. In determination of the contract type, there are many considerations: the degree of technical or cost uncertainty, the procurement method (formally advertised or negotiated), the procurement history (initial or repetitive contract), contractor's accounting system, urgency of the need, existence of competition, dollar value of the contract, nature and extent of subcontracting, laws and regulations, to name but a few. These considerations dictate whether the contract should be a fixed-price or cost-type contract. With the fixed-price contract, the contractor shoulders the risk of cost growth. In cost-type contracts, the government assumes the risk (24:46).

Negotiated procurement is the most common form of contracting in ASD. Negotiation authority for procurements in excess of $100,000 requires approval of the Secretary of the Air Force in the form of a D&F. In any case, negotiation authority is separate from that contained in program directives (30:49).

Changes. If it happens that the contractor is complying with the technical specifications of the contract, staying within cost schedules, and providing a useful product, progress is satisfactory. However, if the contractor has departed from the specifications, yet produced an item that would satisfy the user, the contracting officer and the PM then need to collaborate in an effort to decide whether to adhere to the contract or change it to accommodate what has happened (24:53).

This introduces the need for change orders.

Change Orders. The most frequently invoked clause in the administration of government contracts is the changes clause. There are two reasons: (1) high incidence of custom-made products for government use, and (2) the need for change during job performance to make certain the outputs meets the particular needs of the government (24:53).

When the changes clause is included in the contract, it designates the contracting officer as the only government official with the express authority to unilaterally direct changes to the contract. No other government official has this authority. However, there may be provisions for delegating the authority to authorized representatives (24:53).

Constructive Changes. An inspector, engineer, or PM may issue technical direction to the contractor that generates changes and accompanying costs independent of the change order procedure. These incidents can cause "constructive" changes. They create ready conditions of conflict between the contracting officer and the PM if they are improperly handled. This is a condition where the PM or the engineering representative deals directly with the contractor, bypassing the contracting officer. Usually technical direction means direction within the general scope of the contract (24:54).

Conflict. A reasonable suggestion to avoid such conflict is a clear understanding, in writing, of the limits of technical direction to be followed by government officials working

through the contracting officer in recommending changes. The contracting officer then has options. He may conduct necessary negotiations with the contractor to establish the price of the change prior to issuing the written change order (24:55). In some cases, the PM would be the negotiation team chief with the contracting officer representing a functional element (24:58).

Changes to the contract should be incorporated into the baseline as quickly as possible to insure that the baseline is representative of the entire contractual effort (22:29). (Note: for more information about baselines and changes see "Configuration Management"). Meaningful contract performance measurement requires that cost and schedule information be directly related to work accomplishment. Assignment of budgets to scheduled increments of work effectively integrates these elements so that the measurement of work accomplishment will provide both cost, schedule, and performance data (22:49).

Baseline. Establishment and maintenance of the baseline are the most important aspects of performance measurement. Changes to the baseline must be carefully controlled to avoid distortions in contract cost performance reporting. In order to maintain an effective baseline for measuring contractual performance, baseline budgets should not exceed the contract value (contract target cost plus the estimated cost of authorized - undefinitized work). In exceptional cases, where the baseline budgets are permitted to exceed the contract value, program analysts must thoroughly understand the impact of

this condition on the data reported on Cost Performance Reports (22:49).

Summary. Contracting is a functional expertise, like many other functional activities which contribute to successful program execution. Most of the program output will be obtained through industry sources, and contracting is the means of achieving arrangements with these sources. If mistakes are made, they are longer-lasting and less amenable to simple correction than mistakes in other functional areas. Moreover, the art of contracting is particularly dependent -- if it is to be done right -- on an understanding of the program's requirements. Only someone intimately familiar with present and future program plans can communicate this understanding. That person must be the PM if he wants the right results (10:19-20).

The objective of the contracting process is to get the best source working for the program under the best arrangement -- that competition is a tool for identifying the best source and that the contract is a vehicle for defining the best source and that the contract is a vehicle for defining the best arrangements (10:20).

If the PM, the technical people, the lawyer, and the contracting officer communicate with each other, the right contracting methods can be found. If they do not communicate the facts, and the real intent, problems are inevitable (10:24).

Procurement References:

AFR 70-16	Contract Management in Major Program Acquisition
DAR/ASPR	Defense Acquisition Regulation/ Armed Services Procurement Regulation
AFSCR 23-16	Air Force Contract Management Division
AFSCP 70-4	RFP Proposal Preparation Guide
AFCSP 800-6	SOW Preparation Guide
AFSCR 80-8	Unsolicited Proposals
AFR 70-15	Source Selection Policy and Procedures
AFP 70-22	Administration of Progress Payments

TEST AND EVALUATION

Introduction. Testing is an iterative process where deficiencies are identified and redesign, development, and retesting must be considered (3:10-1). The major Test and Evaluation (T&E) task is to address the areas of critical program questions and development risks which are detailed in the PMD. Areas related to prime mission, state-of-the-art, high-risk, and known marginal performance are emphasized (3:10-1). Two basic kinds of T&E occur throughout the system's life cycle. The first is Development Test and Evaluation, normally accomplished by the contractor and the implementing command's developing agency (usually AFSC). The second is Operation Test and Evaluation, accomplished by the operating command (user) or the Air Force Test and Evaluation Center (AFTEC). For development programs leading to acquisition, OT&E is subdivided into two phases: Initial Operation Test and Evaluation, and Follow-On Test and Evaluation (30:31).

Development Test and Evaluation (DT&E). DT&E is conducted to demonstrate that engineering desing and development processes are complete, that design risks have been minimized, and the system will meet specifications. It encompasses applicable engineering development, simulation, prequalification, qualification, checkout, and other performance demonstration tests. DT&E is usually done in a controlled

environment (33:10). The new article's compatibility and interoperability with existing or planned systems are also tested during DT&E. Sufficient DT&E must be accomplished prior to each major acquisition milestone decision to assure that major objectives have been met. During this period, the SPO is responsible for management of DT&E (30:31).

It is important that the PM understands the basic purpose of the test, and that it is thoroughly coordinated with the right people (such as the user or AFTEC) (33:10).

Developing of test and evaluation requirements requires the same diligence and coordinated effort as performance requirements. Developmental testing and evaluation are the responsibility of the acquisition command, ultimately the PMs. At each step in the iterative development process, they must confirm that sufficient progress has been made to proceed to the next step (7:197).

Follow-on DT&E (FODT&E). FODT&E may be conducted and is comprised of any or all of the elements of normal DT&E, but is distinct because it applies to effort accomplished after the normal DT&E has been completed (usually to incorporate an updating change into the system). In addition, the acceptance and qualification tests inherent to the production and quality control function which require participation of the developing agency (such as quality verification, second-source qualification, etc.) will also be grouped in this classification (1:57-1).

Qualification Test and Evaluation (QT&E). QT&E is the testing performed in lieu of DT&E on programs where there is no RDT&E funding. These programs might include modifications, simulators, software programs, and off-the-shelf equipment. QT&E is usually performed by the implementing command. Essentially, the same test policies for DT&E apply to QT&E (21:103).

Operational Test and Evaluation (OT&E). OT&E is conducted to assess the weapon system's operational effectiveness and suitability. OT&E data also provides information on organization, personnel requirements, and tactics. It is conducted in a realistic operational environment by operational and support personnel with similar qualifications to those who will use and maintain the weapon system when it is deployed. OT&E is usually conducted in two phases each keyed to an appropriate decision point. During full-scale development, IOT&E is the user's evaluation of the weapon system. FOT&E takes place after the production decision. It is conducted by the operating command(s) to ensure the weapon system continues to meet operational needs and that it retains its effectiveness in new or modified environments (30:31).

Qualification Operational Test and Evaluation (QOT&E). Like QT&E, QOT&E is performed in lieu of IOT&E on programs where there is no RDT&E funding. Either AFTEC or the designated MAJCOM conducts the QOT&E. Essentially, the same test policies for IOT&E apply to QOT&E. QOT&E is usually done before

the first production article is accepted. However, HQ USAF may direct that it be done before the initial production decision. For one-of-a-kind production systems, USAF acceptance may come before QT&E and QOT&E. Following QOT&E, FOT&E is conducted as appropriate (21:105).

Evaluation. The term "evaluation" is significant since this effort is not limited to the testing of a complete article at the end of development, but should begin as early as possible in the development cycle and make use of all available forms of visibility, including PDR, CDR, and program review participation (1:57-1-1).

Program Manager/Test Manager/Division Responsibility. The PM depends upon the test manager to keep him supplied with factual information and solid plans (33:11). A major function of a SPO test division is to take raw test requirements and integrate them into a test plan. These requirements may be levied by the PMD, other directives, or by other people through the PM (33:14).

The PM and the test manager are responsible for DT&E and for establishing necessary interfaces to ensure that IOT&E is accomplished. Specifically, they are responsible for (3:10-1):

a. Initiating or updating test documentation such as the Test and Evaluation Objectives and the Test and Evaluation Master Plan (TEMP).

b. Ensuring coordination with appropriate responsible and participating test organizations, AFTEC, and the operating and supporting commands.

c. Managing the contractor test program.

d. See AFR 80-14/AFSC Sup 1 for a more complete list of responsibilities.

The function of the SPO test and evaluation element is to plan, coordinate, and manage all aspects of the testing program. Specifically this involves monitoring the contractor's DT&E program and insuring that the OT&E is completed (7:20).

Responsible Test Organization (RTO). RTO will assist the PM in his budgeting task. The PM should query AFTEC and the using, operating, and supporting commands for their test requirements early enough to include them in the implementing commands planning, programming, and budgeting cycle. Inputs from the participating organizations should include items such as test resources, instrumentation, test articles, and command support costs. Considering these inputs early will allow the PM to use the expertise of these organizations to effect a more responsive test program by proper programming and budgeting (3:10-3).

Planning. Test planning should be a coordinated effort among all agencies involved with the test program. To fulfill the intent of coordinated planning and facilities replanning when necessary, open communications must be maintained between

all test participants throughout the life of the program (12:10-3). Test and evaluation will make up a significant portion of the overall system acquisition planning and schedule (33:25). Results of the test and evaluation are essential factors in the PM's cost-schedule-performance equation and frequently the milestones in the measure of progress (7:197).

USAF-Contractor Relationship. The test relationship between the USAF and the contractor must be spelled out in the contractual documents. Areas such as USAF participation during contractor tests, and resources to be provided by the USAF must be covered both in the contract and in the test plans. The PM must avoid contractually committing government resources to the contractor without previous verification of their availability (3:10-3).

Changes. Changes made prior to production are relatively inexpensive compared to changes required after the contractor has prepared for production. Thus two reasons for testing: to reduce the risks associated with acquiring a new system, and to determine the systems capabilities (33:10).

The PM can expect design changes in the test item as it undergoes testing. These changes must be precisely recorded and tracked (33:30). The PM should set up a system to ensure all players, especially the using command, are kept informed of test objectives, methods, results, and changes (33:22).

Multi-Service Testing. Where the USAF is the lead service in a multi-service acquisition program, T&E is conducted in accordance with USAF directives. When another service or agency is the lead, test and evaluation is conducted in accordance with agreements between the USAF and the other services/agencies involved. If joint testing is sponsored by Under Secretary of Defense for Research and Engineering (US DR&E), the inter-service agreement will include USDR&E. Joint testing with other governments will be in accordance with country-to-country agreements. Test and Evaluation associated with Foreign Military Sales (FMS) programs will comply with USAF test directives as far as possible (12:10-3).

Test and Evaluation References:

DODD 5000-34	Test and Evaluation
AFR 80-14 (AFSC Sup 1)	Test and Evaluation
ASDP 800-14	A Guide for Test and Evaluation Management
AFR 80-20	Managing Joint Test and Evaluation Programs
AFR 23-36	Air Force Test and Evaluation Center (AFTEC)
AFSCR 172-8	Test and Evaluation Report
ASDP 800-18	Flight Readiness Certification by Executive Independent Review Teams

CONFIGURATION MANAGEMENT

Definition. Configuration management is the formal process of identifying the functional and physical characteristics of system components called configuration items (CI), controlling changes to characteristics, and maintaining a record of changes throughout the system life cycle. Configuration management is applied to configuration baselines established at various points during the system life cycle. The objective of configuration management is to ensure that the configuration history and status of CIs are known and supported by adequate documentation at all times during the CI life cycle. As with all other aspects of program management, the degree of configuration management sophistication used depends upon the situation (30:104).

Major Areas. Configuration management is comprised of three major areas: (1) identification; (2) control; and (3) status accounting, and cuts across all program management functions. It is applied during the entire program life cycle and is tailored to that specific program (3:9-11).

a. Configuration Identification. The identification function provides verified technical documentation in the form of specifications, engineering data, and related lists. This documentation is used to define baselines. Generally, there are three baselines. The functional baseline is defined

by the system specification. The development specifications for the CIs define the allocated baseline that is verified by the Functional Configuration Audit (FCA). The Physical Configuration Audit (PCA) verifies the "build-to" requirements of the product baseline defined by the product (Part II) specifications. Process and material specifications also form part of the product baseline. Part numbering and serializing and nomenclature are an important part of configuration identification.

b. Configuration Control. The purpose of configuration control is two-fold: it is to prevent unnecessary or marginal changes while expediting the approval and implementation of the necessary changes. A single-point authority for changes is established in the Configuration Control Board (CCB) Chairman.

c. Status Accounting. Status accounting evolved from a need to properly document the exact configuration of military equipment and the chronology of the changes made to it. It is necessary to monitor change incorporation and provide good logistics support. The index and status accounting reports are to be tailored such that only the information required is recorded and reported. Certain minimum type data for the reports is outlined in AFSCM/AFLDM 375-7. Data elements are normally selected from MIL-STD-482.

Baseline Control. Control of established configuration baselines is through a discipline configuration control procedure

called Engineering Change Proposals (ECPs). The specifications and drawings affected by a change are revised accordingly after the change has been approved (1:11-1). MIL-STD-480 covers the requirements for configuration control and requires the contractor to prepare analysis of the impact if the engineering change described by an engineering change proposal were implemented (1:11-2).

Configuration Control Board (CCB). To provide for proper change evaluation, processing, approval/disapproval and implementation, a CCB is established in ASD SPOs. The CCB is the official agency to act on all proposed changes. Its membership includes a chairman and alternate designated by the SPD, the PM, and representatives from the functional elements and other participating organizations. The chairman, usually the SPD, makes the final decision on changes and will establish the implementation need date as well as the contractual instrument for implementing the change. The CCB decision on any change proposal will be the formal record of decision. It contains the concurrence/nonconcurrence of each member, his official position, the established implementation need date, the impact on production, logistics, training, etc., and the recommended contractual implementation method (12:11-3).

Configuration Management References:

DODD 5010.19	Configuration Management
DOD Guidance 5010.21	Configuration Implementation Guidance
AFR 65-3	Configuration Management
AFSCR 65-3	Configuration Management
TO 00-20-4	Configuration Management Systems
MIL-STD-483	Configuration Management Practices for Systems, Munitions, and Computer Programs
MIL-STD-490	Specification Practices
AFR 27-9	Control and Documentation of Air Force Programs
DOD-STD-480A	Configuration Control -- Engineering Changes, Deviations and Waivers
MIL-STD-481A	Short form of DOD-STD-480A
AFR 57-4	Operational Requirement -- Modification Program Approval
AFSCR 57-4	Retrofit Configuration Changes
AFSCR 57-3	Class V Modification Management
AFSCR 80-33	Class II Modification of Aerospace Vehicles
TO 00-5-1	Air Force Technical Order System
TO 00-5-2	Technical Order Distribution System
TO 00-5-15	Air Force TCTO System
AFR 800-17	Work Breakdown Structure for Defense Material Items

DATA MANAGEMENT

Introduction. Data management cuts across all functional areas and applies a set of disciplines which govern and control the preparation and delivery of contractor data. Data requirements should result from related tasks in the statement of work (1:13-1).

The data management function is performed at the SPO level by Data Management Officers (DMOs). Contractor data requirements are established through a Data Call procedure and acquired by specifying requirements on the Contract Data Requirements List (DD Form 1423) which is incorporated into the contract (1:18-1).

Purpose. Data are acquired during the acquisition program and are used to maintain visibility, program control, make decisions, define a design and to produce, support, operate, maintain, deploy weapon systems. Data also permits support of research, engineering, development, production, cataloging, procurement, training, deployment, maintenance, and related logistic functions. In the final analysis, the PM is responsible for acquiring the contract data necessary to manage all aspects of the program (3:16-1).

Data. The general term "data" includes management, scientific, engineering, and logistics information, reports, and documentation contractually required for delivery from contractors. They include (12:15-1):

(1) Administrative reports

(2) Technical reports

(3) Technical manuals, charts, photographs, films, lists, tapes, drawings, and specifications.

(4) Computer programs and software

Program. In order to control the proliferation of military requirements for contract data, the DOD and USAF organized the Data Management Program. Prescribed disciplines and procedures are applied by the USAF in the (12:15-1):

a. Determination of and justification for data requirements.

b. Orderly acquisition of adequate data.

c. Timely utilization of data.

d. Distribution and storage of data.

Data management is another area where time and money can be saved by early scrutiny of data requirements. Only those data essential to effective management of the program should be obtained. Obtaining data is a particular task of the SPO configuration management element. This is because data to support definition of configuration baselines, change control, and status accounting is a significant portion of the data normally acquired in support of a program (30:107).

Data Management References:

DODM 5105.38	Military Assistance and Sales Manual
AFR 310-1	Management of Contractor Data

ENGINEERING MANAGEMENT

Responsibility. Program managers normally delegate the total system engineering responsibilities to the SPO engineering division. This consists of responsibility to direct and control all technical aspects of the program to meet technical objectives. Engineering analysis, integration, tradeoff studies, specification development, design parameters, item identification, criteria for test and acceptance, and technical and schedule process are functional parts of the systems engineering process (12:8-1).

Information. Systems engineering information is required continually as an input to program management and all functional elements to enable them to complete their individual responsibilities (12:8-1).

Tasks. The tasks of engineering management are to assure that the technical functions are properly planned and implemented, and that the contractor technical functions are tailored, monitored, and controlled to best meet program needs (30:97).

The major portion of detailed engineering tasks are performed by contractors supporting ASD programs, ASD engineers technically manage this contracted effort through establishment of the program technical requirements for the contract statement of work, and observation and evaluation of

the contractors engineering organiztion, system, and performance to ensure compliance with the contracted requirements and specifications (12:8-1).

Objectives. Under the program management concept, all of the engineering functions (reliability, maintainability, safety, etc.) are integrated into the mainstream engineering effort so that the influence of each function is fully brought to bear on the system design and operation. The objectives of this effort, as stated in AFR 800-3, are (30:97):

a. The complete engineering definition, optimization, design, integration, interface control, test, verification, production, delivery, and support of the system which will best meet USAF needs.

b. The efficient planning and control of the technical aspects of the program.

c. The integrating and balancing of system performance, life cycle cost, schedule, producibility, supportability, and other engineering functions mentioned above.

d. The realization of the most cost effective system within the constraints provided in the Program Management Directive (PMD).

Systems Engineering. System Engineering is the engineering management of a total system to ascertain and maintain the technical integrity over all elements of the system. The basic process for system design is the same regardless of the product. An orderly method of definition, design, development, testing, and production is vital in the system engi-

neering process. The alternative is ineffectual operation of the system after deployment and this cannot be tolerated (3:8-20).

Every organization working with the system is affected by the system engineering process. All participants must speak a common language in referring to the system and must have accurate and complete knowledge of it. Such a goal can be attained by timely consideration of all elements in system engineering and documenting the results of the definition process (3:8-20).

Summary. Engineering management occurs throughout the acquisition cycle and close coordination among contractor and SPO engineering elements is essential for effective performance of this task. The outputs of engineering management at each major program milestone are specifications and associated drawings, schematics, studies, and other analyses and documents which define the system and its components. Thus, while it is the contractor's job to "engineer" the system, it is the SPO's job (in the persons of the engineering managers and the PM) to ensure that the contractor understands what the USAF wants in a system and to make certain that the contractor designs, produces, and delivers what is agreed upon. This requires a continuing interface with the contractor at many levels of responsibility throughout the contract period (30:97).

Engineering Management References:

AFR 800-3	Engineering for Defense System
MIL-STD-499A	Engineering Management
AFSCR/AFLCR 80-17	Air Force Engineering Responsibility for Systems and Equipment
MIL-STD-1521A	Technical Reviews and Audits for Systems, Equipments, and Computer Programs
AFR 800-15	Human Factors Engineering and Management

MANUFACTURING AND PRODUCTION MANAGEMENT

AFR 800-9. AFR 800-9, Production Management in the Acquisition Life Cycle, stresses that the production management function exists to provide "a capability to manage the production aspects of a program throughout the acquisition life cycle of a major system, subsystem or equipment" (12:12-1).

Definition. Formally defined, production management is the art and science of properly and efficiently using men, money, machines, materials, and processes to economically produce goods (AFSCM 84-3). It is a composite of manufacturing oriented disciplines such as manufacturing/production/industrial engineering and production planning. These have, as a common goal, the timely development, production, and delivery to the using command of weapons systems which provide required performance at a reasonable cost (12:12-1).

Objectives. In order to accomplish these goals, the following objectives of production management should be recognized (12:12-1).

1. The contractors accomplish sufficient production planning and integrate it into the overall program plan.

2. The manufacturing state-of-the-art technology be applied to production where it is cost effective.

3. The production readiness of the system/hardware be verified through formal review,

including any production engineering or design problem encountered during development.

4. Producibility/production engineering be an integral part of the development process.

Function. Production management functions principally to (1) accomplish production planning during the development cycle in acquisition programs; (2) formally document and review pertinent production criteria before the decision to produce; (3) properly monitor the production program after the decision is made to produce. Meeting these objectives requires integrating production throughout the program life cycle, and reviewing production capability, feasibility, producibility, and readiness preceding the major program decision points. The importance of timely and competent accomplishment of these reviews is emphasized, especially the PRR, which examines not only the readiness of the program but also the capability and readiness of the contractor to produce (3:11-1).

Application. Manufacturing management applies to all programs which may include a production phase. Manufacturing management is tailored to individual programs depending on the volume of production (in both quantity and dollar value) anticipated. Good production planning and management are crucial to program success since most program funds are spent on production. To be most effective, manufacturing

management must be applied throughout the acquisition cycle both before and during the production phase. AFR 800-9 specifies that the objectives of manufacturing management during development are to assure that (30:82):

a. The system design is such that efficient and economical quantity production of the system is possible.

b. All production engineering problems encountered during development have been resolved.

c. The "design to" unit production cost objectives have been achieved.

d. The contractor's production planning is complete.

The Division. The manufacturing and production office is responsible for the production aspects of the program. Production management personnel must ensure that the designs are capable of effective and economical production when the production phase is initiated. It is also their responsibility to determine production lead times, schedule requirements, and analyze contractor ability (7:21).

Manufacturing and Production Management References:

DODD 5000.34	Defense Production Management
AFR 800-9	Manufacturing Management for Air Force Acquisition
AFSCM 84-3	Production Management
MIL-STD-1528	Production Management
AFSCP 84-4	AFSC Guide for Manufacturing Reviews
DODI 5000.38	Production Readiness Reviews
AFSCR 84-2	Production Readiness Reviews
AFR 78-3	Manufacturing Technology Program
AFR 74-1	Quality Assurance Program
AFSCR 74-1	Quality Assurance Program
AFSCP 74-4	Guide for Quality Assurance Managers
MIL-Q-9858	Quality Program Requirements
AFR 800-22	CFE vs GFE Selection Process
AFSCR 800-31	GFE/CFE Selection Process, GFE Acquisition and GFE Management
AFR 27-1	USAF Priority System for Managing Air Force Resources
AFSCR 84-7	Work Measurement for System Programs

INTEGRATED LOGISITICS SUPPORT

Introduction. A significant portion of annual defense expenditures go to support and maintain systems and equipment in the field. Support requirements for spares, maintenance, training, facilities, and the like are determined in large measures by initial design of the equipment. In this regard, additional front-end outlays for designing supportability into systems and equipment can result in significant out-year cost savings for operational use and support. The Integrated Logistics Support (ILS) concept is the driving force in designing and planning weapon system support throughout the entire acquisition process (12:14-1).

Planning. Since support costs account for a large share of the total life cycle cost of most systems, ILS planning during the design of systems and implementation during system operation assumes great importance. Basically, the ILS concept seeks to focus management attention to system support areas in addition to the traditional area of operational performance. As such, DOD and USAF policy recognizes ILS as a program related cost inherent in the overall cost for development, production, and delivery of an operationally effective system (30:74).

DOD policy requires that planning for logistics support begin in the concept exploration phase of a program in order to identify, early in the life cycle, any special

problems which may arise in supporting the system. The logistic support program should be made formal by the program manager at the beginning of the full-scale development phase. At that time, appropriate ILS milestones to be met throughout development, production, and deployment should be established. On large programs, a Deputy Program Manager for Logistics (DPML) will be identified to perform this task. The DPML is an Air Force Logistics Command (AFLC) officer or civilian assigned to the SPO responsible for determining and refining the requirements and documentation for ILS. The DPML also assists the SPD and PM in performing and assessing tradeoffs between design characteristics and operational and support requirements for the total program life cycle to achieve the lowest practical cost of ownership. The primary task of the DPML, however, is the preparation of the Integrated Logistics Support plan and critical evaluation of the contractor prepared Integrated Support Plan (30:74). PMs depend heavily on the ILS expertise of the DPML (7:196).

Objective/Program Manager Action. The overall objective of applying ILS to weapon system acquisition is to achieve and sustain a required readiness posture at the minimim life cycle cost. To do this, PMs must (17:14-1):

(1) Systematically plan, acquire, and manage logistics support resources throughout the weapon system life cycle.

(2) Consider the logistics effects of design and operational concepts, beginning with program initiation and continuing throughout the life of the system.

(3) Acquire support resources in a time-phased manner that is compatible with the acquisition program milestone.

Program. The ILS program within DOD has the purpose of reducing the logistics burden of new programs while meeting the stated technical performance requirements of the system or equipment being acquired. The ILS program is usually accomplished in four distinctive steps. The first step is the assessment of the logistics impact and identification of critical areas; the second step is the selection of logistics design criteria; the third step is analysis to identify the most economical means of meeting the technical requirements, and the identification and evaluation of alternatives. The fourth step is the monitoring of performance and correction of deficiencies after delivery to the user. The PM is responsible for the ILS program, although he normally discharges the ILS responsibility to the DPML (3:12-1).

Elements. Elements included in the ILS process are: (1) reliability and maintainability, (2) maintenance planning, (3) support and test equipment, (4) supply support, (5) transportation and handling, (6) technical data, (7) facilities, (8) personnel and training, (9) logistics support resource funding, and (10) logistics support management information (7:22).

Summary. Integrated Logistics Support can be summarized in three short phrases: design for support, design the support, and support the design. The difficult task of designing for support requires a blending of support considerations with the performance considerations at the time design decisions are made. Designing the support must be accomplished with an awareness of total support requirements, rather than simply accomplishing the instant task at hand. Finally, supporting the design, the time-honored task of logistic support, will be accomplished under whatever conditions the design and mission dictate. Any success of the effort to integrate support needs with the performance needs will be realized while supporting the system. Likewise, solutions to support shortcomings will also be recognized and, hopefully, be integrated into the current system or successor systems (12:14-8).

Integrated Logistics Support References:

DODD 5000-39	Development of ILS for Systems/ Equipment
AFP 800-7	ILS Implementation Guide for DOD Systems and Equipment
AFR 800-8	Acquisition Management -- ILS Program
AFSCP/AFLCP 800-34	Acquisition Logistics Management
AFR 800-4	Transfer of Program Management Responsibilities
AFSCR 170-2	First Destination Transportation
AFSCR 800-4	Transfer of Program Management Responsibility

PROGRAM CONTROL

Functions. The Program Control element of the SPO has six major functions: estimating, budgeting, scheduling, planning, analyzing, and forecasting. Estimating is the cost consideration of a program. Budgeting is an allocation of costs over time. Scheduling is a time consideration statement of the program. Planning is the translation of schedule and budget symbology into assigned/described tasks. Analysis is the measurement of progress versus plans/schedule and budget and provides status information. Forecast is the output of analysis (3:6-1).

Suggestions for the Program Manager. The following are several suggestions which the PM and program control should consider. Because of variation in program complexity, SPO organization, contract, and so forth, not all of these will apply to all programs (3:6-11).

a. Document the assumptions upon which the cost estimates are made.

b. Make sure that program additions are submitted promptly for approval.

c. Participate with the financial manager in financial reviews and presentations.

d. Ensure that hardware engineers are cost conscious.

e. Be fully aware of all Government Furnished Equipment (GFE) procurements to avoid duplication.

f. Participate personally in reviews and decisions concerning program changes to the program and ensure that the financial manager participates so that he can keep track of them and advise on the possible cost effect.

g. Ensure that the financial manager established through contract action (with the contractor) a format of regular and prompt submittal of cost and manpower information, progress versus plan, and that the plan or forecast is not changed without PM knowledge or approval. The PCO and ACO can help in this area.

h. The PM and the contractor should each have the same information in the agreed upon format on which to base presentations, recommendations for changes, or problem solutions. This does not mean the contractor should know what is budgeted. He should not. The contractor should be working to his budget for the work package he has contracted to provide.

i. A complete annual versus planned program progress review is essential to establish a base of departure for the contractor cost study.

j. Have regular meetings with the contractor to review cost, schedule, and technical (quality as well as quantity) performance.

Resource Management Division. The resource management division of Program Control contains two major types of people: accountants/budgeteers and management/cost analysts. The accountants and budgeteers allocate and control funds. Their tasks include issuing purchase requests, forecasting obligation dates, and tracking unliquidated obligations. The management analysts also perform a vital function for the SPO. Their tasks include cost estimating, contractor

performance analysis, value engineering change proposal, engineering change proposal and contract change proposal analysis; inflation studies; and life cycle cost analysis (21:75).

Appropriations. No discussion about program control would be complete without discussing the major fiscal appropriations commonly used by SPOs and reviewed by DOD and Congress.

3010 Aircraft Procurement. Provides for fabricating and procuring aircraft weapon systems, modifications, direct ground support equipment, aircraft industrial facilities, investment-type spares, war consumables, miscellaneous aircraft requirements, first destination transportation, and technical data (21:24).

3020 Missile Procurement. Provides for fabricating and procuring missile weapon systems, operation, space systems, modifications, investment-type spares, component improvements, missile industrial facilities, miscellaneous missile requirements, first destination transportation, site activation, and technical data (21:25).

3080 Other Procurement. Provides for fabricating and procuring of ground command, communication and control equipment, modifications, first destination travel, and technical data (30:42).

3400 Operation and Maintenance (USAF). Provides for expenses, not otherwise provided for, necessary for

the operation, maintenance, and administration of the USAF. This includes such expenses as operation, maintenance, modification, and update of aircraft and missiles (21:25).

3600 Research Development, Test and Evaluation (RDT&E). The primary use is to fund RDT&E efforts for USAF programs, to include RDT&E under contract with private industry, educational institutions, and other Government agencies. AFSC also uses this appropriation to operate base facilities in the same manner that other commands use the operational and maintenance appropriation (30:42).

The 3010, 3020, and 3080 appropriations are available to incur obligations for three years. The RDT&E 3600 appropriation is available for obligation over a two year period; however, in order to obligate in the second year, forward financing approval must be obtained. Refer to AFM 172-1 for details on how to use budget appropriations (30:42).

Program Control References.

AFSCR 27-1	Program Direction
AFR 800-6	Program Control -- Financial
AFSCR 800-6	Program Control - Financial
AFR 172-4	The Air Force Budget
AFM 172-1	USAF Budget Manual
AFSCP 173-6	Cost/Schedule Control Systems Criteria
AFACP 173-6	C/SCSC Joint Surveillance Guide
AFSCP 800-15	Contractor Cost Data Reporting System
AFR 173-1	The Air Force Cost Analysis Program
AFSCR 173-1 (Sup 1)	Air Force Cost Analysis Report
ASDR 173-1	ASD Cost Analysis Program
AFSCM 173-1	Cost Estimating Procedures
AFR 800-11	Life Cycle Cost Management Program
AFSCR 800-11 (sup 1)	Life Cycle Cost Management Program
AFR 800-4	Selected Acquisition Reports
AFSCR 800-5 (Sup 1)	Selected Acquisition Reports
AFSCR 172-9	RDT&E Forward Financing
AFR 57-1	Statement of Operational Need
DAR 15-000	Contract Cost Principles and Procedures

SYSTEM SAFETY

Definition. System safety is defined by MIL-STD-882A to be the "optimum degree of safety within the constraints of operational effectiveness, time and cost, attained through specific application of system safety management and engineering principles throughout all phases of a system's life cycle." It is very important to realize that system safety is concerned with the safety of both personnel and equipment. The application of system safety to insure the preservation of equipment expands its scope in the traditional safety field, and established it as an engineering area. The basic guidance document for system safety is MIL-STD-882A, System Safety Program Requirements. This is a very broad document and must be tailored to fit the individual program. The other basic document is AFR 127-8, Responsibilities for USAF System Safety Engineering Programs and the AFSC supplement thereof. This gives specific requirements to be applied to most programs (12:906).

Key People. The key people in the conduct of a system safety program are the PM and System Safety Focal Point (SSFP). The SSFP is responsible for ensuring that adequate safety requirements are established for each program or project managed by ASD and for monitoring the performance of the contractors. The System Safety Office is available to advise, provide training, and monitor the

system safety activity at ASD. A System Safety Officer is assigned by ASD to each SPO to provide system safety expertise as needed (12:9-6).

Timing. It is important that system safety be included in the program at an early date. It is the PM's responsibility to see that it is included early. The earlier that the system is analyzed, the easier it is to eliminate or control any hazards that might be found. In a typical program most of the system safety effort should be completed by the CDR. The overall approach should be outlined in the PMP and implemented by the RFP. The requirements must be tailored based on the specific system and the acquisition cycle phases being considered in the contract (12:9-6).

System Safety References.

AFR 127-8	Responsibilities for USAF System Safety Engineering Programs.
ASDP 127-1	System Safety Program
MIL-STD-882A	System Safety Program Requirements.

SUBCONTRACT MANAGEMENT

Why. The process of developing and manufacturing weapon system requires a wide variety of skills, and experiences to create the elements of a defense system. It is virtually impossible for one organization to maintain the necessary expertise to accomplish the wide variety of tasks that are required to field a weapon system. Consequently, when a firm contracts with the government for the development and production of a weapon system, that contractor must subcontract with other firms in order to obtain the services necessary to complete the program. The magnitude of subcontracting that occurs is substantial. It is estimated that 50 percent of every dollar paid to DOD prime contractors is paid out to subcontractors.

Control. Over half of the dollars that have been paid to the prime contractor are going to subcontractors, along with a good portion of the risk associated with the program's success. Also, the PM has lost direct control of these dollars and risks. This loss of control exists because there is no privity of contract between the government and the subcontractor. The contractual relationship exists between the prime contractor and the subcontractor. Thus, the PM must depend on the prime contractor to satisfactorily manage the dollars and risks for him. The burden of this responsibility falls on the prime contractor (4:2).

Problems. When a program runs into difficulties, quite often the problems can be traced to a subcontracted component or item. Many of the unforeseen problems, schedule slippages, and cost overruns occurring during the acquisition process are the result of a lack of adequate and timely subcontract management by the prime contractor (4:2).

AIR FORCE PLANT REPRESENTATIVE OFFICE

Definition. Associated with the contractor physically but assisting the SPO is the Air Force Plant Representative Office (AFPRO). As field organizations of the Air Force Contract Management Division (AFCMD), they are responsible for the administration of DOD and USAF contracts at specific industry plants. Individuals in these offices represent the government on a daily basis (34:20). This office can become a key extension of the SPO and the PM by engaging the contractor on a full-time, real-time basis. Usually such key activities as the administration of the contract, the quality control program, the configuration control elements, and the acceptance test and product acceptance are accomplished by this office for the government. The actual signing of product acceptance documents (DD 250) and disbursement (or withholding) of funds is accomplished by the plant representative. This office can be the strong right arm or the weak link in the program management chain (34:18).

Memorandum of Agreement (MOA). Working agreements between the SPO and AFPRO are formalized in a written document called the MOA which allows both parties to have a common understanding of their respective responsibilities (1:63-1).

SYSTEM STAFF OFFICER/PROGRAM ELEMENT MONITOR

Definition. The System Staff Officer (SYSTO) at Headquarters, AFSC, and the Program Element Monitor (PEM) at Air Staff are the key coordinative points for the SPO. The PEM has a particularly crucial role in coordinating the DCP and issuing the PMD which outlines the management objectives of the program (34:19).

Communication. Both informal and formal communication are necessary to assure that all participants and higher headquarters are continuously informed of program progress. The PM and SYSTO must be kept continuously informed and up-to-date on program progress. Telephone calls, memos, and early drafts of reports, plans and briefings from the PM assist the PEM and SYSTO. The PEM and SYSTO keep the higher headquarters staffs aware and prevent unnecessary requests from filtering down to the PM. They also prepare the PM for "hard questions" expected at formal briefings. Formal briefings and reports are also a regular part of the process (7:199).

The PEM and SYSTO, as they coordinate the documentation, depend heavily on the PM and SPO for assistance and answers to key questions. Effective interface with all participants and proper attention to coordination and communication requirements play a major role in the decision process (7:200).

AIR FORCE ACQUISITION LOGISTICS DIVISION

Definition. Air Force Acquisition Logistics Division (AFALD) is an AFLC organization. AFLCR 23-17 states AFALD's mission:

> . . . is to improve USAF, joint services, and security assistance force readiness by challenging requirements and assuring consideration of supportability, reliability, and maintainability during the design, development, and production process of weapon system acquisition . . .

AFALD is the primary link between AFLC and AFSC in the weapon system acquisition process. AFALD normally provides the DPML/ILSM and other logistics personnel to the ILS directorate of a SPO. AFALD also provides technical guidance and assistance to the DPML/ILSM. Also, the AFALD personnel in the SPO are responsible for involving the proper organizations in AFLC in ILS development and implementation (21:120).

USING COMMAND AND SUPPORT OFFICES

Purpose. The using command plays the predominant role in identifying and validating mission needs as well as establishing the operational requirements which must be met. The using commands (MAC, TAC, SAC, ATC) are "the ultimate customer" and the systems acquisition process exists to satisfy their needs with deployed, mission-capable and supportable weapon systems. The PM must not lose sight of this fundamental purpose.

With this purpose in mind, the using or operating commands maintain liaison or support offices (MAC Support Office [MACSO], TAC Support Office [TACSO], etc.) at ASD to support the PM's needs for various programs (21:43).

The assigned personnel and individuals from operational units monitor and support most system activities. They advise the PM of the operating command's interests and concerns related to the operational use of the system. The individuals provide operating guidance relative to the operating command's performance and schedule requirements (21:44).

The PM must always keep the operating command abreast of changes which might affect their planned operation and deployment of the system.

Air Training Command (ATC). ATC develops and provides all training concepts and plans for the system, trained people,

and training facilities as well as assisting in the acquisition of much of the training equipment (30:71).

FOREIGN MILITARY SALES

Introduction. Foreign Military Sales (FMS) is a challenging and exciting aspect of systems acquisition. Not only does the PM face the challenges of "normal" program management, he also copes with the peculiarities of FMS. In addition, he must develop a good relationship and represent the government with dignity in dealing with the foreign governments (21:213).

Definition. FMS are reimbursible sales of weapon systems to foreign governments or international organizations under the authority of the Foreign Military Sales Act (FMSA) and the Arms Export Control Act. Agencies of the United States Government arrange for and manage the transaction between the foreign entity and the U.S. defense contractor. Government legislation specifies the responsibilities of each major Government agency involved in FMS activities, establishes broad eligibility requirements, and delineates financial and other management and policy guidelines for the conduct of FMS. Congress maintains overall control of FMS through the budget process. Under the overall guidance of the President, the Department of State determines basic eligibility and broad execution policy. The DOD manages and executes FMS programs. Within DOD, FMS policy is established in DOD directives. This policy is interpreted and implemented in USAF and major command regulations (30:116).

Foreign Military Sales References:

DODM 5105.38	Military Assistance and Sales Manual.
AFR 400-3	Logistics -- Foreign Military Sales
AFR 800-18	Program Management of Systems Acquisition for FMS
AFSCR 177-1	Accounting and Finance -- Foreign Military Sales
AFSCR 200-5	Disclosure of Military Information to Foreign Governments and Foreign Nationals

GLOSSARY

Administrative Contracting Office (ACO). Normally the contracting officer assigned to a contract administration of such as Air Force Plant Representative Office (AFPRO) or Defense Contract Administrative Service Management Area (DCASMA). He is responsible for the functions assigned DAR 1-406 related to the administration of contracts.

Air Force Systems Acquisition Review Council (AFSARC). The senior Air Force advisory council for system acquisition. Its membership includes the Under Secretary of the Air Force, the Assistant Secretaries, the Vice Chief of Staff, and designated Deputy Chiefs of Staff. The AFSARC reviews: major programs as part of the SECDEF milestone decision process; other designated acquisition programs before decisions by the SAF; and in special instances, other acquisition programs when the decision to be made is of such importance that it requires SAF attention (AFR 800-2).

Allocation. The process by which HQ USAF authorizes MAJCOMs to obligate funds for approved programs.

Allotment. The process whereby the MAJCOMS release funds to the field or operating organizations. Allotments allow these organizations to commit and obligate released funds.

Apportionment. The process of determining how much and when the different approved programs will require obligations of funds. Prior to the start of the fiscal year, OSD and OMB conduct apportionment hearings with the USAF to establish funding requirements by fiscal year quarters for approved programs. Apportionment does not make funds available, it only establishes the USAF's obligation requirements on a time profile basis.

Appropriation Bill. Funds are made available to proceed with a program (funding process).

Avionics Engineering Division. Provides the engineering management of avionics subsystems such as communications and navigation, fire control, and electronic warfare equipment.

Automatic Test Equipment (ATE). ATE is a generic term for equipment (separate or built-in) satisfying a test function (diagnostic or condition indicating) and possessing an automatic capability. In this sense, ATE can be either a part of the mission equipment or it can be a part of support equipment (Also, see MIL-STD-1309). (AFR 800-12).

Budget Cycle. The four phases of the budget cycle are outlined below:

Phase I - Executive Formulation and Transmittal. The DOD budget is put together in the PPBS and submitted to the Office of Management and Budget (OMB). In January, the President submits his budget to Congress.

Phase II - Congressional Action. Congress has hearings and debates on the proposed budget and then prepares authorizing and appropriating legislation by 25 September.

Phase III - Budget Execution and Control. This phase is controlled by OMB. Through OMB, funds are transferred for spending at all management levels in the service.

Phase IV - Review and Audit. This phase is performed continually by OMB, General Accounting Office (GAO), the Defense Audit Service, and other audit agencies.

Budget Execution. This is the process of releasing appropriated funds to the field for authorized programs. This phase continues until all congressionally approved funds are expended or withdrawn.

Budget Formulation. SECDEF submits the amended PDMs to the services and allows them until the end of September to return a budget estimate. Between October and December, the budget estimate is jointly reviewed by OSD and OMB. Beginning in November, OSD publishes Program Budget Decisions (PBDs). The USAF accepts or reclamas the PBDs as they are received. OSD considers the reclamas and issues final PBDs, generally by the end of December. As with PDMs, it is also customary practice for OSD, Services Secretaries, and JCS to hold joint meetings to resolve major issues arising out of the issuance of a PBD by OSD. The culmination of these events results in the DOD input to the President's budget which is provided to the Congress in January.

Budget Estimate Submission (BES). Budget estimates contain the prior year, current year, and budget fiscal year pricing of programs. Estimates are based on the POM, PDMs and economic assumptions related to pay and pricing policies. The services each send their BES to OSD in September.

Ceiling Price. A negotiated amount that specifies the maximum liability of the Government for a given acquisition.

Change Order. A written order signed by the contracting officer, directing the contractor to make changes that the changes clause of the contract authorized the contracting officer to make without the consent of the contractor. (Defense Acquisition Regulation Manual [DARM] No.1).

Commitment. A specific amount of currently available funds reserved for funding specified obligations. Commitments are normally effected by using one of the following forms: AF Form 616, Request and Authority to Cite Funds; Military Interdepartmental Purchase Requests (MIPRs); Funded Purchase Requests; Obligation Authorities (OAs); Project Orders; and Administrative Commitment Documents (ACDs - AFSC Form 276).

Competitive Negotiation. A negotiated acquisition that (1) is initiated by a Request for Proposals, which sets out the Government's requirements and the criteria for evaluation of offers, (2) contemplates the submission of timely proposals by the maximum number of possible offers, (3) usually provides discussion with those offerors found to be within the competitve range, and (4) concludes with the award of a contract to the one offeror whose offer, price and other factors considered, is most advantageous to the Government (DARM No. 1).

Concept Exploration Phase. The identification and exploration of alternative solutions or solution concepts to satisfy a validated need, usually through the use of contracts with competent industry and educational institutions. This phase requires the active involvement of all participating commands to identify the candidate, solutions and their characteristics. One or more of the selected candidates solutions are then approve for entry into the Demonstration and Validation phase (AFR 800-2).

Configuration (Change) Control Board (CCB). A board composed of representatives from program/project functional areas such as engineering, configuration management, contracting, manufacturing, test and logistic support, training activities and using/supporting organizations. This board approves or disapproves proposed change requests (AFSCP 800-7).

Constructive Change. During contract performance, an oral or written act or omission by the contracting officer or other authorized Government official, which is of such a nature that it is construed to have the same effect as a written change order (DARM No. 1).

Contract Data Requirement List. A listing of data requirements authorized and made a part of the contract on DD Form 1423, "Contract Data Requirements List," or mechanical equivalent (AFSCM/AFLCM 310-1).

Contractor Furnished Equipment. Property, other than Government furnished, used by the contractor in the performance of a contract (AFSCM 27-1).

Critical Design Review (CDR). A CDR is conducted on each configuration item (CI) before commitment to production, to determine the acceptability of detail design, performance and test characteristics.

Defense Acquisition Executive. The principal advisor and staff assistant to the Secretary of Defense and the focal point in OSD for system acquisitions (DODD 5000.1).

Defense Acquisition Regulation. Uniform policies for the Department of Defense relating to the acquisition of supplies and services under the authority of Title 10, United States Code, chapter 137. Formerly called the Armed Services Procurement Regulation.

Defense Systems Acquisition Review Council (DSARC). An advisory council established by and functioning for the Secretary of Defense (SECDEF) to apprise the SECDEF of the program status and readiness of a major defense system prior to proceeding to the next phase in the acquisition process (AFR 80-14).

Definitized Agreement. A contract that has been signed by both the contractor and the Government. The term usually implies that a price has been negotiated and has been reflected in the contract.

Demonstration and Validation Phase. The period when selected candidate solutions are refined through extensive study and analyses; hardware development, if appropriate; tests; and evaluations. The objective is to validate one or more of the selected solutions and give a basis for deciding whether to proceed into Full-Scale Development (AFR 800-2).

Deputy Program Manager for Logistics (DPML). The Logistics representative for major programs at the SPO. He is directly responsible to the SPD for all logistic tasks. He ensures that logistic participation and support capabilities agree with program objectives and that logistics support requirements are reflected in the system design (AFSCP 800-3).

Design Engineering. The use of technical information generated in the systems engineering process to develop detailed approaches, design solutions, and test procedures to prove these solutions.

Determination and Finding. A formal document that records the decision of a contracting officer and higer approval, if necessary. Determination and Findings are used to secure approval to negotiate rather than advertise, to use a cost type contract, and to exercise an option.

Engineering Change Proposal (ECP). A change is proposed in the form of an ECP. The ECP contains a description of all known interface effects of the change and information concerning changes in the function/allocated/product configuration identification baseline. Changes are classified as Class I or Class II engineering changes. Class I changes affect contractually specified form, fit, function, cost or delivery schedule of configuration items and must be approved by the Government. All other changes are denoted by the Government, but must be reviewed by the cognizant government plant representative for concurrence in classification.

Equipment Engineering Division. Provides the engineering management of ground support and crew/human factors equipment.

Expenditure. An actual payment of funds for products delivered or billing submitted by contractors. The Government pays out program funds either as progress payments or for delivered items.

Flight Systems Engineering Division. Provides the engineering management of airframe structures and propulsion and power subsystems.

Formal Qualification Review (FQR). The objective of the FQR is to verify that the performance (as determined by tests) of a configuration item (CI) complies with specifications. At the FQR, the CI is officially certified for entry into the USAF inventory.

Formal Review Participation. The main players at the formal technical reviews are the contractor and SPO (principally the Chief Engineer and PM). However, using and support command personnel also actively participate. They assist the PM in assessing the operational and supportability aspects of the program.

Full-Scale Development Phase. The period when the system and the principal items necessary for its support are designed, fabricated, tested, and evaluated. The intended output is, as a minimum: a preproduction system that closely approximates the final product; the documentation needed to enter the production phase; and the test results that show the product will neet the requirements. This phase includes the acquisition of long lead production items and limited production for OT&E (AFR 800-2).

Functional Configuration Audit (FCA). Contractor adherence to the allocated baseline is established by the FCA. The FCA is a formal review conducted by the SPO to validate that CI functional characteristics are in conformance with the allocated baseline as properly modified by formal change procedures.

Government Furnished Equipment. Separable equipment and components of a total system acquired by the USAF and supplied to the system prime contractor for integration into the system.

Government Furnished Property. Property in the possession of or acquired by the Government and delivered or otherwise made available to a contractor for use in accomplishing a contract. (AFSCM 57-2).

Implementing Command. The command (normally AFSC) charged with responsibility for acquiring systems and equipment for the USAF inventory. (AFR 800-4).

Informal Technical Reviews. Reviews that are conducted to supplement formal technical reviews The format, agenda, and participation at them are left up to the PM's discretion. They provide a flexible and powerful tool for progress measurement and engineering control.

Integrated Logistics Support Manager (ILSM). An experienced logistician who is assigned to manage ILS for programs not designated as major programs. (AFR 800-8).

Integrated Logistics Support Plant (ILSP). An Air Force management plan developed and used by the program manager and the DPML or ILSM, to manage the ILS process. This includes the horizontal integration of the ILS elements, (that is, with each other), as well as their veritcal integration into the various aspects of program planning, engineering, designing, testing, evaluating, and during production and operation. It also includes the integration of support elements with the mission elements of a system

throughout its life cycle, and is updated as the program evolves. The ILSP is a part of the Program Management Plan (PMP) and, when approved, becomes directive on all participating agencies. (AFR 800-8).

Issue Papers. Papers prepared for the SECDEF by OSD, highlight key issues, lists alternatives, and evaluates cost and effectiveness of alternatives. They are reviewed by the SCS and USAF prior to submisssion to the SECDEF.

Item Manager (IM). The AFLC ALC (or other service or agency) assigned the management responsibility for commodity-type items by Federal Supply Class. (AFSCP 800-7).

Letter of Offer/Acceptance. A document, DD 1513, that records the offer of the United States to sell and the foreign government's agreement to buy a given article or service.

Life Cycle Cost. The total cost of an item or system over its full life. It includes the cost of acquisition, ownership (operation, maintenance, support, etc.) and, where applicable, disposal. To be meaningful, an expression of life cycle cost must be placed in context with the cost elements included, period of time covered, assumptions and conditions applied, and whether it is intended as a relative comparison or absolute expression of expected cost effects. (AFR 800-11).

Logistics Engineering. The use of technical data developed by the systems engineering process to refine the support plans, concepts, and requirements for operational use of the system.

Major Program. A program so designated by OSD which normally will have an estimated cost of $100 million in RDT&E and/or $500 million in production.

Major System Acquisition. A system acquisition program designated by the Secretary of Defense to be of such importance and priority as to require special management attention (DODD 5000.1).

Milestone Ø Decision. Approval of MENS and authorization to proceed into Phase Ø -- Concept Exploration -- which includes solicitation, evaluation and competitive exploration of alternative system concepts. Approval to proceed with Concept Exploration also means that the Secretary of Defense intends to satisfy the need. (DODD 5000.1).

Milestone I Decision. Selection of alternative and authorization to proceed into Phase I -- Demonstration and Validation. (DODD 5000.1).

Milestone II Decision. Selection of alternative(s) and authorization to proceed in Phase II -- Full-Scale Development -- which includes limited production for operational test and evaluation. Approval to proceed with Full-Scale Development also means that the Secretary of Defense intends to deploy the system. (DODD 5000.1).

Milestone III Decision. Authorization to proceed into Phase III -- Production and Deployment. (DODD 5000.1).

Not-to-Exceed Price. An amount stipulated by the contractor for which he will do a defined amount of work. Not-to-exceed prices are typically submitted as part of Class I engineering change proposals. If the contracting officer decides to order the contractor to make the change by means of a change order, the not-to-exceed price is stipulated in the change order and represents the maximum amount the contractor can collect for performing the work.

Obligation. A transaction entered into by the USAF which imposes a liability for payment of money. Obligation may result from placing orders, awarding contracts, receiving services, or any transaction which establishes a legal requirement for future disbursement of funds.

Request for Proposal. The solicited contract between the USAF and the contractor on a contemplated acquisition. It is the medium by which a contractor is introduced to the job desired by conveying a complete understanding of the work to be performed and to determine the capability and price of the contractor's efforts. RFPs contain language, terms, and conditions necessary to obtain information from prospective bidders. (AFSCM 27-1).

Participating Command. A command or agency designated by HQ USAF to support and advise the PM. A supporting command is also a participating command. (AFR 800-2).

Physical Configuration Audit (PCA). A PCA is usually accomplished by the Contract Administration Activity. This occurs during the preproduction or first production on first preproduction CIs to verify that the CI functional and physical characteristics are in conformance with the product baseline as properly modified.

Preliminary Design Review (PDR). Conducted for each system CI. The purpose of the PDR is to evaluate the progress,

consistency, and technical adequacy of a selected design and test approach, and to establish compatibility between the program requirements and the preliminary design.

Procurement Contracting Officer (PCO). The contracting officer at the purchasing office (SPO) which awards or executes a contract for supplies or services on behalf of the Government, by formal advertising, by negotiation, or by coordinated or interdepartmental procurement, and when authorized by DAR 20-703, administers such contracts.

Producibility. The relative ease of producing an item or system which is governed by the characteristics and features of a design that enables economical fabrication, assembly, inspection, and testing using available production technology.

Production and Deployment Phase. (1) The period from production approval until the last system is delivered and accepted. The objective is to efficiently produce and deliver effective and supportable systems to the operating units. This includes the production of all principal and support equipment. (2) Deployment.- the period encompassing the process of uniting facilities, hardware and software, personnel, and procedural publications; and delivering an acceptable integrated system to the using and supporting commands. This overlaps the production phase.

Production Engineering. The use of technical data developed through the systems engineering process to develop the plans and procedures for tooling, materials, quality assurance, and manufacturing.

Production Readiness Review (PRR). A formal examination of a program to determine if the design is ready for production, production engineering problems have be resolved, and the producer has accomplished adequate planning for the production phase.

Program Assessment Review (PAR). Quarterly status reviews of each major system program. Normally, a 30-minute presentation by the program manager. Program assessment review presentatations are made to the Commander AFSC. (AFSCP 800-3).

Program Decision Memoranda (PDM). Decisions made during the SECDEF review of the issue papers become tentative PDMs. After review and comment by the services involved the PDMs are "amended" as necessary to become final program guidance. The military departments then make the required changes in

their POMs. Collectively, these actions constitute SECDEF approval of the new FYDP.

Program Management Responsibility Transfer (PMRT). The transfer of program management responsibility for a system (by series), or equipment (by designation), from the implementing command to the supporting command. PMRT includes transfer of engineering responsibility. (AFR 800-4).

Program Objective Memorandum (POM). Service document which recommends to the SECDEF how the services want to allocate resources. This is the primary programming document and the initial step in locking in the total level for a program element. The POM preparation is supervised in the USAF by the chairman of the Air Staff Board. Preparation of the POM starts in November for submission in May.

Progress Payment. A payment made as work progressess under a contract on the basis of percentage of completion accomplished, or for work performed at a particular stage of completion.

Purchase Request. An authenticated document prepared by a purchasing office that stipulates the quantities and delivery dates of supplies or services. Purchase requests authorize the contracting officer to acquire the items.

Share Ratio. A formula which represents a joint responsibility for ultimate costs that is translated into a sharing in any dollar difference between target and final costs. For example, a 70/30 share ratio means 30 cents of every dollar is the contractor's responsibility. (DARM No. 1).

Sole Source. Characterized as the one and only source, regardless of the marketplace, possessing a unique and singularly available performance capability for the purpose of contract award (sometimes used interchangeably with the term "single source"). (DARM No. 1).

Specialty Design Review (SDR). Conducted to review system documentation, assess the effectiveness of engineering management activities, and ensure that the contractor is ready to proceed into preliminary design of system components. A SDR should be conducted as a final review before the submission of Demonstration and Validation (D&V) phase product or as the initial Full-Scale Development review for systems not requiring a formal D&V phase.

Support Equipment. Support equipment includes all equipment required to perform the support function, except that

which is an integral part of the mission equipment. It does not include any of the equipment required to perform mission operations functions. (AFR 800-12).

Supporting Command. The command (normally AFLC) charged with responsibility for providing logistics support and designated to assume program management responsibility from the implementing command. (AFR 800-4).

Synopsis. The art of publicizing proposed Government advertised or negotiated acquisitions including modifications to existing contracts in the Commerce Business Daily.

System Acquisition Process. A sequence of specified decision events and phases of activity directed to achievement of established program objectives in the acquisition of Defense systems and extending from approval of a mission need through successful deployment of the Defense system or termination of the program. (DODD 5000.1).

System Design Review (SDR). Conducted to review system documentation, assess the effectiveness of engineering management activities, and ensure that the contractor is ready to proceed into preliminary design of system components. A SDR should be conducted as a final review before the submission of Demonstration and Validation (D&V) phase products or as the initial Full-Scale Development review for systems not requiring a formal D&V phase.

System Engineering Division. This division integrates the efforts of all engineering divisions into a consolidated engineering position and provides technical guidance in the engineering specialties.

System Requirements Reviews (SRR). SRRs are conducted when a significant part of the system functional requirements has been established. The basic purpose for conducting SRRs is to evaluate the contractor's responsiveness to the statement of work and interpretation of the system requirements.

System Engineering Process. A logical sequence of activities and decisions transforming an operational need into a description of system performance parameters (requirements) and a preferred system configuration. (AFSCP 800-7).

System Manager (SM). The AFLC focal point for integrating and managing the functional elements of logistics on a timely basis, to ensure the support of the assigned system. During the acquisition phases and before program transfer,

the SM provides a vital link to the DPML or ILSM in support planning concepts. (AFR 800-8).

System Operational Concept. A formal document that describes the intended purpose, employment, deployment and support of a system. (AFR 80-14).

Termination Contracting Officer (TCO). The contracting officer appointed to terminate contracts for convenience, and for default, when found in the best interest of the Government according to DAR. Also to enter into settlement agreements by negotiation with the contractor.

Test Engineering. The use of technical data from the systems engineering process to develop test plans which outline the procedures and requirements that are to be used to test the design solutions.

Test and Evaluation Master Plan (TEMP). When required by program direction (PMD/Form 56), a TEMP is prepared in coordination program. A stand-alone document, the TEMP reflects the coordinated inputs/requirements of all participants in the test program and should serve as the primary source document for developing the test section of the RFP. The test section 5 of the PMP may refer to the TEMP rather than repeat TEMP material. The TEMP will be updated as specified in DODD 500-3.

Test Planning Working Group (TPWG). The TPWG is established by the PM and test manager, composed of representatives of all interested test agencies and chaired by the SPO test manager. Some of the functions of the TPWG are to provide a forum for test related subjects, to assist in establishing test objectives and evaluation baselines, to define organizational responsibilities and relationships, to estimate costs and schedules, and to identify needed test resources. The TPWG also assists in the preparation of the Test and Evaluation Master Plan (TEMP), and other T&E related documents. AFSC organizations in the TPWG will coordinate on these documents; coordination of OT&E will also assist (within their areas of expertise) in preparing test portions of RFPs and related contractual documents and in evaluating contractor proposals.

Value Engineering. A method used in eliminating "gold-plated" and overstated requirements, thereby lowering costs without impairing the functional or operation effectiveness of an item.

Warrant. A document signed by legal authority that authorizes a person to become a contracting officer. Only warranted contracting officers can commit the Government.

3

PERSONAL INTERVIEWS

PERSONAL INTERVIEWS

Introduction. Personal interviews were conducted with program managers working in ASD. The interviews were designed to obtain specific information regarding program management from the individuals doing the work. The questions asked were to determine the need for the ASD Program Management Resource Document (PMRD) and to gather information for it. Specifically, first, to determine the need, questions were asked about the need f r the document, if the PMs felt it would be helpful, if any documents like it existed, and if PMs like and/or used the existing documents that ASD PMRD will supplement. Second, for content information, questions were asked concerning the information a new PM would need to know to get started in his job, what the most time-consuming and/or important PM tasks are, and about interfaces -- their functional support

Thirty program managers were interviewed. Program management experience ranged from three months to over 20 years. Specifically, the following is a compilation of those interviewed: Four System Program Directors -- three Colonels, one civilian GS-15; Seven Projects Directorate/ Division Deputies/Chiefs -- two Colonels and five Lieutenant Colonels; and 19 Program/Project Managers -- one Lieutenant Colonel, one Major, four Captains, seven First Lieutenants, five Second Lieutenants, and one civilian GS-13.

All PMs were interviewed face-to-face in their respective organizations. The format for the interviews were a set of nine prepared questions with explanatory, supporting, and extemporaneous discussions by both the interviewer and the respondents before, during, and after the formal questions.

The following sections contain the formal questions and their answers and in some cases, additional information about the answers. The additional information was compiled by the interviewer from the general discussion of the PMs. (Note: Numbers in parenthesis following sentences indicate the number of PMs, out of a total of thirty, that mentioned that response.)

QUESTION 1: What do new PMs need to know/do to get started in the job and make a positive contribution or to have the potential to make a positive contribution to the SPO immediately from the beginning (certainly sooner than if he didn't know/do these things)?

Some of the most important information gained was from PMs responses to the first question. Most of the PMs expressed a concern for new PMs to learn the job well and quickly so that earlier in the PMs career he would be aware of the many things that which he may have to be familiary in the future rather than may confront him in the future.

The PMs identified many items that a new PM should know to get started in the job and many of the PMs mentioned the same items.

Most of the PMs indicated that a new PM should initially work under the supervision of an experienced PM (18). The new PM would be assigned to assist this experienced PM on a program, working closely with each other so that the new PM could gain knowledge and experience in a "non-hostile" environment. This supervisor would be available to direct work, give information, and answer questions. The supervisor-subordinate arrangement would be an on-the-job training (OJT) relationship (6). In accord with gaining experience under supervision, the new PM learns his job simply by doing the job, gaining experience daily (8).

Once a new PM is assigned to an organization (SPO at ASD, some PMs felt it valuable for him to attend formal

orientation courses outlining acquisition management, the acquisition process and cycle, what AFSC and ASD do, and how the SPO fits in the AFSC scheme of operation, as well as what the SPO generally does (11). Orientation courses are conducted at ASD, at AFIT (SYS 123), and in some SPOs.

In addition to orientation courses, most of the PMs felt formal systems acquisition management courses (AFIT SYS 223) should be taken by all new PMs (16). Some PMs specified that AFIT SYS 223 should be taken only after six months to one year of SPO work (5). Schooling was thought to be almost useless if taken too late in a PM's career.

Some SPOs have implemented training plans and the PMs feel they are an acceptable alternative when new PMs cannot, for various reasons, get into SYS 223 (9). The SPO training plans supplement other formal training and are completed as time permits. Most plans include readings and briefings with the readings being general information and the briefings being more specific to the particular organization.

Interfacing with functional specialists was mentioned quite often as being a necessity for any PM, especially new PMs. PMs stated they should know how the SPO is organized for interfacing (1) and know the role of the specialists (1) that PMs should be given an overview of the functional organizations (1) and be exposed to the key

in each (3). Experienced PMs are firm believers that the functional specialists are the ones that do the work and the PM should know who the sources of information and expertise are, where they are located, and what their functions are (9). Most of the functional specialists are knowledgeable, professional civilians and PMs must know the "who, how, and where" of working with them (3).

Not only should new PMs work with and talk to experienced people, in addition to being formally trained, but they need to have or develop a certain type of personality. A few of the PMs interviewed talked about characteristics that a PM should have: a positive attitude and drive and initiative (1), an aggressive and assertive, confident personality (1), and above all else, flexibility (1).

As soon as a PM is assigned to a program he should begin learning things about that program. He should learn the configuration of the program and of the weapon system it is a part of (1); he should learn the special language (acronyms, key terms)(6) of the program (1) and the program philosophy -- how the program is managed and where the responsibilities exist (1).

There are two things a PM can do to learn much about the program. First, he should attend a detailed program review (3) that describes the weapon system, its subsystems, its position in the acquisition cycle (1) and the participating organizations. Second, some required

program reading will help. The PM should obtain and read the SPO operating instruction (1), the PMP, PMD, program history, the latest SPR briefing, and the contract -- SOW, RFP and specifications (2). The PM should also develop and read the program "read file" (1). Knowing what these documents are and what they say will do much to aid the PM in learning about the organization and the program and what the program objectives are.

Also, in learning about acquisition management and the program, the PM should have at his disposal DSMC course material (1), and acquisition management literature (4).

So that the PM knows the reason he and the program exist he should know how a weapon system is "born" (5) and how direction is formulated (2).

There are some other "need to know" items that the PMs mentioned. They were not mentioned as often but nontheless are quite important to understanding and performing the program management function.

It was recommended that new PMs should learn and understand the role of the contractor in the system acquisition process (1) and to also understand the relationship of the weapon system use (1). A visit to the contractor's facility is helpful in knowing who is responsible for what on the industry side (2). Since a large portion of what the PM does deals with the administration of a complex contract, should understand the contractual game -- change

orders, ECPAs, supplemental agreements, and what types of contracts to look for (3). The procurement specialists can be very helpful in this area. In addition, the new PM should not be afraid to ask any questions about any area (5). Someone with the knowledge will always be willing to answer them or find the answer. The new PM should quickly become aware of what is required of him, his tasks (6), what he is supposed to do, and what he is not supposed to do (1). A definitive PM position description (1) would help in this area, but very few SPOs have them.

In summary, the new PM should gain knowledge and experience through orientation courses, formal system acquisition management training, working with a supervisor initially and then being assigned specifice tasks and a program; and by asking questions of experienced PMs and functional specialists during an OJT period and continually during the daily performance of his job.

Question 2: Would an ASD Program Management Resource Document, a document that defines and describes the functions, responsibilities, and interfaces of the PM, be useful to a new PM? (The ASD PMRD was described in detail to the respondents.)

Of the 30 respondents, 21 thought the ASD PMRD would be useful, eight were undecided, and one PM said it "probably" would not be useful.

One SPD not only felt the PMRD would be very useful, but he wanted a copy for himself and his PMs (1). Fourteen PMs requested a copy for their use. A Deputy for Projects in a major SPO felt the PMRD is a good idea that should have been written long ago (1). He also felt it could have helped him in transition from a flying career to his present job. A chief of a projects division felt he could have used the PMRD when he was starting in program management and that it would be helpful to new PMs (1). A civilian PM echoed those same comments (1). A relatively inexperienced PM expressed the need for a "book that tells the real program management job" -- outlining how "things" (acquisition management, interfaces, etc) work (1). A rated captain, a PM for the first time, felt the PMRD would be useful just like his flying regulations and he also said there is a need "for a reference to find references" (1)

The only negative comment came from a Colonel who is a SPO program management division chief. He felt there

is too much literature already and more is not needed. He did not offer a solution or any other ideas, however (1).

The PMs that were undecided generally felt the PMRD is a good idea but were unsure of its usefulness in light of the already published documents and SPO and AFIT training courses (5).

Question 3: Does a document like the ASD PMRD exist. Does the respondent use or know of AFSCM 800-3, ASDP 800-22 and other program management documents?

No PM interviewed knew of a document that accomplished what the PMRD is attempting to accomplish.

Several SPDs and PMs identified SPO or organizational training plans that are designed to accomplish the PMRD goals in the long term. None of these apply to PMs before they begin the job. In particular, the Simulator SPO, ASD/TA -- Tactical Systems, and ASD/AE -- Aeronautical Equipment have internal organization training plans. The interviews identified mixed emotions about the usefulness of them. Generally, most PMs felt some valuable information is gained, but all felt they are too time-consuming and take too long to complete. And, as most of the required readings are regulations, negative feelings exist because of the general perception that regulations are wordy, ambiguous, and inapplicable to "real world" program management.

In ASD/TA, an organization with five SPOs (its training plan applies to all of them), there were PMs that were completely unaware that a training plan exists.

In questioning PMs about the use of program management documents; most know they exist, however, some PMs did not; only four PMs used them with any regularity (4). Most PMs simply are aware the regulations exist but do not use

them for such reasons as ambiguity, wordiness, obsolescence, inapplicability to the program, and because they are too theoretical or complex for new PMs.

One SPO said he used the "Handbook for Managers of Small Programs" (1975) -- even though his is a major program; he also used DSMC course material (1). A Foreign Military Sales PM also used the same handbook to supplement his use of all the regulations (1).

A Chief of Projects in a major program felt that research reports from Air University and Air Command and Staff College are helpful in specific areas; areas that probably do not apply to many programs but may be helpful to a few people (1).

One PM used the McCarty/Valore report "The Acquisition of Major Systems" as an overview (1).

A PM with two years experience felt AFSCP 800-3 is useful but also felt a condensed version is needed (1).

Question 4: Do you feel that the experience level of PMs is currently greater or less than in the past?

Every PM interviewed agreed that the program management experience level is currently less than before. The main stated reason is that lieutenants are replacing captains and majors separating from the USAF.

Another reason, as one experienced PM mentioned, is that the new PMs do not have any experience in management engineering. They come to the program management with "obscure" backgrounds (history, chemistry, social sciences) and cannot relate to the product technically or to the concept and methods of management (1).

Question 5: What PM task takes most of your time? What other tasks take much of your time? (Particularly tasks eliminating time that could be used for more important tasks.)

In answering this question, the respondents named 32 separate tasks that they felt took most of their time. Fourteen of these tasks were mentioned by more than one individual. The conclusion implied from these statistics is that there are many tasks that may consume a PMs time. For any single PM, what determines which task or tasks will take the most time is a function of the type of program, its phase in the life cycle, its problems, and the kinds of people he works with.

The following is a discussion of the tasks that were identified as time consuming and of which all PMs should be aware.

Seven PMs expressed a concern about the amount of time spent on paperwork and correspondence (7). Much of the time, a PM is concerned with writing letters to contractors, functional organizations, and other participating organizations. The letters may be written to generate action, illicit a response, ask for assistance, or often times in response to someone else's letter. The PM should be aware that he will be initiating, reviewing, and answering correspondence for many reasons as part of the job. Thus, it is valuable for the PM to know how to write an effective military letter (1).

Another time-consuming task is reviewing and reporting the status of the program (4). The PM must always know the status of the program to maintain control and to plan for its future. To know the status of the program, the PM must continually review all of its aspects by checking and cross-checking the schedules, plans, and reports with the contractor, the AFPRO or DCAS, and the functional specialists. Reviewing the program status with each functional specialist will provide the PM with a current status of each specific program area. It is then the PM's job to insure that the status of the specific part is in consonance with all others and the total program.

The PM as a result of continually reviewing all aspects of the program, is the one individual most qualified to report the program status. The program status must be reported to all the functional organizations, it must be reported to supervisors, the SPD and all higher authority, the user, and other participating organizations. The PM should review the program and build a consolidated program position status and be the central point of contact for reporting the program status.

A time consuming task mentioned by only three PMs, but one that all PMs must do, is coordination (3). Coordination is obtaining agreement on a written position usually a letter to the contractor or other organizations

outside the SPO) from all functional organizations. A coordinated letter is one in which all concerned participants have reviewed the letter and agree on its content prior to it being sent. Many times the PM must explain and support the position to those who will coordinate it. Often the PM must overcome disagreement with the position. The coordination process is a checks-and-balances process that helps insure that the coordinated position has no cost, schedule or technical faults. It is time consuming but is designed to be an effective review and informational forum. In addition to correspondence, both incoming and outgoing, there is other program documentation in the form of reports and data. The PM must take the time to review these documents for their accuracy and applicability to the program and he must take the time to ensure the proper documents are distributed to the right people (3).

Along with reporting the program status by correspondence, the PM must brief the program status. Status briefings and other informational briefings, both periodic and one-of-a-kind, are important, time-consuming PM tasks (3). Many SPOs require PMs to give monthly program review briefings where the program status is briefed, problem areas identified, and questions from the SPD and others must be answered. In addition to monthly briefings, the PM is often called upon to give briefings on the program or its

problems to higher authority, the user, or other organizations. To give effective briefings, the PM must know the program in detail.

The PM must conduct many meetings for the program to be run effectively (2). Meetings are the forum by which the PM and the program team (functional specialists) exchange information, consider alternatives, review documentation, and make decisions. The PM usually chairs such program meetings, sets the tone, and often is the key to their success. The PM must be prepared for meetings and ensure they are productive, by having the right people attend.

Many PMs spend time gathering information (2). PMs must gather information from functional organizations and other participating organizations to aid planning, controlling, and decision-making. The more information a PM can gather the more effectively he can do his job. Information gathering helps answer inevitable questions.

Because the PM must always know the program status and is continually gathering information and is the program's point of contact he is often called upon to answer questions concerning the program (2). Everyone calls the PM to ask any possible questions; he must be prepared to answer them immediately or know how to find the answer.

Phone calls are a quick, effective means of

corresponding, answering questions, and gathering information. While they do not take the place of formal correspondence and documentation, they provide the PM with a way to gain and communicate quickly. PMs in ASD spend a good deal of time on the phone, especially with the program contractor (2). To avoid spending an excessive amount of time on any one call, it is a good idea that the PM have an outline of a limited number of high priority items that need to be discussed.

The above has been a discussion of the prominent time consuming tasks of which a PM must be aware. The following are other tasks that ASD PMs mentioned less frequently as time consuming.

Program Managers must take time interfacing with higher headquarters on an information basis only (2); valuable time is lost simply because the PM must work within the large government bureaucracy and combat "redtape" (2); problems (anomalies) are a part of every program and a PM must take the time to "trouble shoot" to work these problems (1). Some other tasks mentioned were planning (1), monitoring delivery schedules (1), keeping up with changes (1), testing (1), logistics (1), and working suspenses (1) (suspenses are correspondence that require an action be taken or completed by a specified date). Also mentioned were gaining PM experience (1), learning program specifications and its contract statement of work (1), interfacing

with contractual specialists and other functional specialists (1). One PM spent most of his time making his own schedule of events and managing it (1). Some PMs were occasionally frustrated for various reasons: (a) A PM spent time describing to functional specialists what he did rather than doing his job (1); (b) A PM felt everything he had to do took longer than he expected (this is something all PMs should expect) (2); (c) A PM had to take time to make inputs to and review ASD management aids (computer scheduling) but they were not useful to him in performing his job (2); (d) A group of PMs felt they wasted valuable time with the standard USAF extra duties (3). Finally, one PM summed up the question on time consuming tasks by saying he takes time "doing what has to be done" (1).

Question 6: What PM tasks do you feel are most important?

In answering this question the PMs named at least 55 tasks and responsibilities as those they felt were most important. Many of the tasks are interrelated, thus they will be discussed together. There is a group of about eight tasks that form the core of the most important tasks for most of the PMs.

In general terms, one PM summed up this question by answering that the most important thing that a PM does is "getting the job done" (1).

In more specific terms, PMs identify, work, and solve the inevitable problems that all programs experience (9). Some managers call this process "trouble-shooting" (1), other deal with problems with management by exception (3) or Management by Objectives (MBO) and some simply call it "firefighting" (3). By whatever name or method, the PM must continually deal with problems -- non-normal occurrences/situations in cost, schedule, and performance. To deal with problems effectively the PM must be aware that they will occur, plan for them, and know how to identify them before they become bigger problems.

Because private industry builds what the government has requested, much of what the PM does is concerned with contractor interface. Most PMs said interfacing (planning, communicating, getting and giving information, working

problems, etc.) with the contractor is one of the most important things they do (22).

In addition to contractor interface, the PM spends much of his time interfacing with the functional organizations and other participating organizations. As with contractor interface, interface with all the participating organizations is a very important PM task (14). Interfacing with the functional specialists usually requires the PM to be the leader of a program team or working group (3). A program team limits the number of people that the PM has to deal with. The team players are identified and assigned areas of responsibility.

The PM must also interface with the user (SAC, TAC, MAC) and in the case of FMS, the user is the buying country (6). This interface is necessary to get changing user requirements implemented into the contract and program and also to keep the user abreast of program progress.

Occasionally, the PM must interface with higher authority (ASD, AFSC) to obtain high level decisions (2).

Basically, the PM insures through the interface process that all the program participants are involved in the program and know the current status. Often times the PM must interface to keep people working, keep the "ball rolling" (2), or to get technical people to consider other functional aspects, such as the contract implications of a technical decision (1).

Another important PM task is planning and controlling (5). The PM should plan and plan ahead and have contingency plans for the time the program varies from what is expected (2).

To aid getting the job done through interfacing, planning, and controlling, the PM must communicate effectively (6). Communicating is giving and getting information, vertically and horizontally, using both verbal and written mediums.

Program managers should document all their activities and conversations (6). Documenting actions and the rationale for them will support the PM if he must later defend the actions. Documenting conversations, both face-to-face and phone calls, eliminates questions concerning who said what. Documentation is recording information at the time it is obtained and maintaining the record for possible future use or reference.

Coordination, documentation, information, and communication are all closely related. The PM will have to use them on the job; how well he uses them may determine how well he does his job.

Two PMs felt coordination -- getting an established SPO position before a decision is a very important part of the PM job (2).

Some other areas that PMs should be aware of that are important are: cost-control -- staying within the

budget (4); evaluation of the contractor's performance to help ensure meeting program objectives; processing the many changes that occur during all program phases (5); evaluating proposals (1); fact-finding (1); and negotiation (2) to help get the desired product for the best price. Phone calls (10), meetings (1), and asking questions (2) were all said to be important especially in the exchange of information. The PM should have and consider all information (1) before taking action.

Because many new PMs do not have technical backgrounds, it is important that they take the time to familiarize themselves with the technical aspects of the program -- the terminology, design, and function (3).

Because there are so many things a PM must do, he should prioritize his tasks by importance and/or by date required (4).

In addition to cost control, the PM must concern himself with maintenance of the schedule; losing or gaining time in the schedule costs money (7).

Other important tasks mentioned were attending technical and program reviews -- these keep the PM informed and facilitate controlling the program (1); giving support to the functional specialists in doing their job (1); complying with direction (1); and simply staying on top of things (1). The PM that does not know his program and what is going on is going to lose control.

Question 7: How is work assigned to PMs? What is the PM-supervisor relationship in terms of supervision, review, and autonomy?

The majority of PMs are assigned to large programs (F-16, A-10, F-15) and are given the responsibility for a subsystem (project) of the weapon system (18). Other PMs are assigned to SPOs that have many programs (Simulator, RPV, Aeronautical Equipment, Support Equipment). PMs in these SPOs are given the responsibility for a single program -- some being quite large in dollar value and others being relatively small (4). Some SPOs have either small or large projects, assign PMs to a contract or contractor (4). In this situation, the contract is for a subsystem is separate from the total integrated weapon system contract, and the contractor is a subsystem supplier to an integrating contractor. This differs from PMs who manage a subsystem of a single contractor weapon system. In the case of the Fighter Attack SPO which deals primarily with FMS, the PMs are responsible for an aircraft being produced for a foreign allied country. The PM manages that country's aircraft production and delivery (i.e., F-5s for Switzerland) (3). The final case, usually found in most SPOs especially with inexperienced PMs is when a PM is assigned to a more experienced PM. The new PM assists his supervisor in managing the program (5). In this case the program responsibility is in the hands of the supervisor

rather than the single PM as in the previous cases.

Almost all SPDs and Project Chiefs/Deputies allow their PMs to work completely autonomously (11), to work with limited autonomy within certain bounds or guidelines (11).

Usually the amount of autonomy that a PM receives is based on his supervisor's (SPD, Project Chief/Deputy) perception of the PM's capability to perform. But, regardless of the level of the PM's autonomy, supervisors usually review his actions (5) and assist him when he encounters unresolvable problems (5).

In some programs the PM works the problems by gathering information and building rationale and the program team under direction of the supervisor jointly decides and agrees on an action (4). The PM usually heads and is the key to the program team or working group (3), in gathering information and building a position coordinated among and taking into account all functional parts of the program. The supervisor expects this coordinated position prior to his review of any given situation (17).

Question 8: Do you receive adequate support from the functional organization?

Less than one-third of the PMs interviewed stated that they did not have any problems getting support from the functional organizations (8). Although all of these PM admitted that they do share at least some of the functional specialists with other programs. Another three PMs made the same comment about having to share support, basically due to the ASD matrix, but made no comment on whether they had experienced problems or not (3).

The remaining eleven PMs commented negatively on functional support (eight made no comment). Several PMs commented that because of the lack of support they had to do some of the work of the functional specialists (5). This took time from the PM job because they first had to find out that they were not going to be supported, then they had to learn how to do the tasks, do the tasks, and then find out the process of getting the document approved. This situation can happen regardless of program priority.

There were various reasons mentioned for inadequate or nonexistent support. Some PMs said the ASD matrix took functional specialists out of the SPO (3) and program loyalties were decreased or eliminated (2). The most frequent problem seemed to be lack of support because of program priorities (3). A manager of two small programs did

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not get support because the functional specialists supported the larger (seemingly higher priority) programs first (1). This PM also perceived he lacked support because he is a lieutenant (1). PMs generally agreed that because of the ASD matrix support was more difficult to obtain, especially engineering support, than when all the functional experts were located in the SPOs (4).

Some PMs experienced problems not because of priorities, the matrix, or undermanning (1) but with the people themselves. One PM felt he was not getting adequate support because some of the functional specialists were not ambitious, therefore he had to do their work (1). Another PM experienced support problems because all the SPOs utilized only a few specialists in one area because they were perceived as hard working and able to get the job done -- the result being they were overworked and others sat underworked (1). This same PM also experienced some functional organizations where only one individual has the knowledge to do a necessary task -- again this individual's time was limited (1).

PMs must be aware that while frequently they will get adequate and timely support from functional specialists they also often must deal with priorities, undermanning, and limited experience. Many times the PM must be prepared to learn and do the functional work. And many

times meetings will not be properly supported by all parties (3). Therefore, the PM must be patient and flexible and have contingency plans ready for these occasions. Some PMs provide valuable advice: Often the amount or lack of support a program and PM gets is directly related to the quality of the interpersonal relationship the PM has built with the functional specialist, regardless of priorities.

Question 9: Any suggestions, tricks-of-the-trade, helpful hints, or additional comments?

New PMs should develop a way to apply new technology to real world situations and problems (1).

Some of the problems in managing a program are in losing the program corporate knowledge through attrition or transfer. The corporate knowledge should be accurately documented in real time (not after the fact) so that new PMs will have the corporate knowledge available in useful form. The other way would be to have overlap of tranfers but the "USAF doesn't do it that way".

PMs need to give feedback to the functional specialists (both good and bad) in order to show that they are supported by the PM (1).

PMs should list and track action items and keep a status to keep on top of everything (1).

Several PMs felt that building strong interpersonal relationships with all the people they work with is important. It is important for a more agreeable and pleasant working relationship and facilitates obtaining functional support. One PM expressed this situation as building trust and credibility with the people and using mutual cooperation in getting the job done (1). It is felt that cooperation and informal compromise (negotiating actions) made formal contractually, is important (1).

To get the job done well, the PM must first prove himself capable (1).

One of the best ways a new PM can learn is from the functional specialists (1).

A PM should have patience because nothing gets done quickly, things are always changing, and problems always occur (2).

Things generally take longer than they should (1).

A PM is a jack-of-all-trades (functions) (3).

A PM does not have to know everything, just know who knows (1).

For the PM, formal training eliminates misconceptions (1).

A PM should avoid getting too much information on a topic by listening to people with inputs about an area that is not their concern (1).

4

SUMMARY/CONCLUSIONS/RECOMMENDATIONS

The objectives of this thesis were to increase the author's knowledge of program management while satisfying the need for a document like that in Chapter 2 the Aeronautical Systems Division (AFSC) Program Management Resource Document (ASD PMRD).

Through interviews with program managers in ASD, the thesis problem was documented as the need for a reference document that describes the ASD Program Management function. After the problem was identified, a literature search was conducted of applicable regulations, books, reports, and other documents to gather information to compile the thesis product.

The ASD PMRD is the thesis product written to satisfy the need for such a document. The ASD PMRD discusses and describes the responsibilities and interfaces of the PM. Specifically, Chapter 2 contains an overview of Systems Acquisition Management and the System Program Office (SPO) and more specific discussions of the Program Manager, his Interfaces, Planning and Controlling, and the Government-Contractor relationship. Also included are sections describing the SPO functional elements.

While many managers are called Program Managers, this thesis applies to the PM that works in a SPO projects group, manages a system or subsystem, and reports to a projects head. More specifically, it is designed to be an

informational document for first-time PMs to help them to conduct their job. It provides more information than is currently available in a concise, useable form and gives them an accurate awareness of what they will encounter on the job.

To gather current information specific to ASD, 30 PMs were interviewed. They were questioned about what new PMs should know and do to get started on the job, what they felt the most time-consuming and the most important program management tasks are, and how they are supported by the functional elements. Conducting personal interviews was an information gathering exercise only, therefore no analysis of the results was anticipated.

Upon receiving the responses the author determined that analysis of several potential issues would provide ASD with valuable information. However, analysis was not done as it was not in the scope of the thesis effort. This introduces the need for some recommendations.

There are many potential issues from the Personal Interviews (Chapter 3). Analysis could be done to determine the effectiveness of training programs for new PMs (Question 1); the effectiveness of the ASD matrix and functional support (Question 7); the relationship between time-consuming and important program management tasks (Question 5 and 6). Additional information or topics can be obtained

through additional interviews with those PMs interviewed (Appendix A) or other PMs.

In conclusion, this thesis helped me meet the requirements for a Master of Science in Systems Management; it helped me gain much more information about my career field; it will hopefully help program managers in ASD; finally, I hope it helps you in your job or academic endeavor.

APPENDIX A.

LIST OF PERSONNEL INTERVIEWED

Allen, Captain Stephen D., USAF. ASD/YPR. Wright-Patterson AFB (WPAFB) OH. 1 June 1981.

Arnold, Second Lieutenant Tony A., USAF. ASD/TAX. WPAFB OH. 1 June 1981.

Backes, Second Lieutenant Charles, USAF. ASD/YPR. WPAFB OH. 1 June 1981

Bellan, Major James A., USAF. ASD/TAMA. WPAFB OH. 10 May 1981.

Boyd, Colonel Stuart R., USAF. ASD/YPR. WPAFB OH. 21 May 1981.

Campbell, First Lieutenant Donald, USAF. ASD/AE. WPAFB OH. 3 June 1981.

Casey, Lieutenant Colonel Francis J., USAF. ASD/RWSM. WPAFB OH. 19 May 1981.

Crane, Colonel Benjamin D., USAF. ASD/TAA. WPAFB OH. 13 May 1981.

Cronin, Second Lieutenant Thomas, USAF. ASD/YWM. WPAFB OH. 26 May 1981.

Davis, Captain Charles E., Jr., USAF. AFALD/YJT. WPAFB OH. 19 May 1981.

Firmin, First Lieutenant Glynn R., USAF. AFALD/YJT. WPAFB OH. 19 May 1981.

Glendenning, Colonel William H., USAF. ASD/AFY. WPAFB OH 14 May 1981.

Hollenbaugh, Roger E. AFALD/YJT. WPAFB OH. 19 May 1981.

Horn, Second Lieutenant John, USAF. ASD/RWT. WPAFB OH 29 May 1981.

Lee, Colonel James, USAF. ASD/YWM. WPAFB OH 14 May 1981.

Lenneman, Captain James A., USAF. ASD/RWJM. WPAFB OH. 19 May 1981.

Letzelter, Lieutenant Colonel Cyril J., USAF. ASD/TAX. WPAFB OH. 20 May 1981.

Kelly, Lieutenant Colonel Thomas J., USAF. ASD/YYM. WPAFB OH. 27 May 1981.

Koebbe, Captain Terence A., USAF. ASD/TARR. WPAFB OH 20 May 1981.

Kosak, Lieutenant Colonel Robert, Jr., USAF. AFALD/YJT. WPAFB OH. 14 May 1981.

Krejci, Colonel Ronald J., USAF. ASD/RWT. WPAFB OH. 13 May 1981.

O'Hern, Lieutenant Colonel Wayne L., USAF. ASD/YYM. WPAFB OH. 20 May 1981.

Osborne, First Lieutenant Jerry W., USAF. ASD/TAMA. WPAFB OH. 3 June 1981.

Piscitelli, First Lieutenant Nataline F., USAF. ASD/TAFF. WPAFB OH. 26 May 1981.

Riecks, Second Lieutenant Susan M., USAF. ASD/RWJM. WPAFB OH. 15 May 1981.

Scott, Lieutenant Colonel Martin D., USAF. ASD/AFGR. WPAFB OH. 15 May 1981.

Singer, James E. ASD/RWS. WPAFB OH. 12 May 1981.

Tucker, First Lieutenant Arthur A., USAF. ASD/TAAF. WPAFB OH. 21 May 1981.

Weinhold, First Lieutenant Robert L., USAF. ASD/RWJM. WPAFB OH. 27 May 1981.

Wilson, First Lieutenant Michael, USAF. ASD/AE. WPAFB OH. 1 June 1981.

SELECTED BIBLIOGRAPHY

1. Aeronautical Systems Division, Deputy for Systems. Systems Acquisition Illuminators for SPOs. Washington: Government Printing Office. May 1974.

2. _____. Handbook for Managers of Small Programs. ASDP 800-14. Washington: Government Printing Office. 1 October 1975.

3. Air Force Systems Command. A Guide for Program Management. AFSCP 800-3. Washington: Government Printing Office. 9 April 1976.

4. Alexander, Roger S. "The AFCMD Subcontract Management Function or What an AFPRO Subcontract Management Function Can Do For the Program Manager." Unpublished Report. PMC 77-2. Defense Systems Management College, Fort Belvoir VA. November 1977.

5. Baumgartner, John Stanley. Project Management. Homewood Illinois: Richard D. Irwin, Inc., 1963.

6. Bellan, Major James A., USAF, IR Maverick Missile Program Manager, ASD/TAMA, Wright-Patterson AFB OH. Personal Interviews. 26-30 January 1981.

7. Cassity, James S. Managing the Air Force. Chapter 9. "Systems Acquisition Management." Research Report. Air War College, Maxwell AFB AL. January 1980. AD B043040L.

8. Cleland, David I. and William R. King. Systems Analysis and Project Management. New York: McGraw-Hill Book Company. 1968.

9. Colligan, Lieutenant Colonel John J., USAF, Deputy for IR Maverick, ASD/TMMA, Wright Patterson AFB OH. Personal Interviews. 18-23 January 1981.

10. Defense Systems Management School. Introduction to Military Program Management. Washington: Logistics Management Institute, LMI task 69-28. March 1971.

11. Department of the Air Force, Air University (ATC). Life Cycle Costing QMT-353. Textbook. Air Force Institute of Technology, School of Systems and Logistics, Wright Patterson AFB OH. 1981.

12. _____. Deputy for Armament Systems, Armament Division. AD/SD Program Management Handbook. Eglin AFB FL. December 1980.

13. _____. Contract Management in Major Program Acquisition. AFR 70-16. Washington: Government Printing Office. 2 January 1974.

14. Department of Defense Directive. "Major System Acquisition." Number 5000.1. 19 March 1980.

15. _____. "Major System Acquisition Procedures." Number 5000.2. 19 March 1980.

16. _____. "Major System Acquisition." Number 5000.1. 18 January 1977.

17. Electronic Systems Division, Business Management Branch, Comptroller. Program Business Management Handbook. Hanscom AFB MA. June 1979.

18. _____. Program Business Management Handbook. Hanscom AFB MA. June 1977.

19. Engebretson, Colonel Roger W., USAF, System Program Director, AGM-65 Maverick System Program Office, ASD/TAM, Wright Patterson AFB OH. Personal Interviews. 19-23 January 1981.

20. Hattershire, Major Bond R., USAF. IR Maverick Missile Program Manager, ASD/TAMA, Wright Patterson AFB OH. Personal Interviews. 19-23 January 1981.

21. Huffman, James W., Vincent J. Lozito, Jr., and Larry A Snyder. Weapon Systems Acquisition Guide. Unpublished Research Report. No. 1220-81. Air Command and Staff College, Maxwell AFB AL. 1981.

22. Kemps, Robert. "Cost Performance Reporting and Baseline Management." Unpublished Report. Defense Systems Management College, For Belvoir VA. 1978.

23. Lippencott, George E. "The Program Manager's Authority in the Acquisition Environment: An Evaluation." Unpublished Report. Defense Systems Management College. PMC 76-2. Fort Belvoir VA. November 1976. AD A037114.

24. Mankin, Richard Thurmand. "The Contracting Officer and the System Manager: An Analysis of Authorities and Responsibilities within the Department of Defense." Master's Thesis. George Washington University. February 1974. AD 780693.

25. McCarty, Dyke and Major Thomas Valore. "The Acquisition of Major Systems." Unpublished Research Report. Air Force Institute of Technology, Wright Patterson AFB OH. April 1978.

26. Office of the President, Office of Management and Budget. "Major Systems Acquisition." OMB Circular A-109. Washington DC. 5 April 1976.

27. Putney, Robert F. "Program Management: The System Program Office and Foreign Military Sales." Unpublished Research Report. No. 5734. Air War College, Air University, Maxwell AFB AL. April 1975. AD C003773L.

28. Restivo, Major Johnny D., USMC, Deputy for Laser Maverick, ASD/TAMA, Wright Patterson AFB OH. Personal Interviews. 19-23 January 1981.

29. Roberts, Edward H. Jr. "Systems Acquisition Manager Training: An Integrated Approach." Unpublished Study Project Report. PMC 76-2. Defense Systems Management College, Fort Belvoir VA. November 1976. AD A035162.

30. Runkle, Marty T. and Michael L. Smith. Systems Acquisition Guide. Unpublished Research Report. Edited by Charles H. MacGregor. Air Command and Staff College, Air University, Maxwell AFB AL. May 1971.

31. Sayles, Leonard R. and Margaret K. Chandler. Managing Large Systems. New York: Harper and Row Publishers. 1971.

32. Steiner, Gary A. and William G. Ryan. Industrial Project Management. Toronto: The Macmillan Company. 1968.

33. Wingo, Jon. "Handbook for Test Managers of Small Programs." Unpublished Research Study. Air Command and Staff College, Air University, Maxwell AFB AL. May 1977. AD B019731L.

34. Wirtanen, Dalton N. "A Systems View of an Air Force Program Office." Unpublished Research Report. PMC 76-1. Defense Systems Management College, Fort Belvoir VA. May 1976. AD A032602.

BIOGRAPHICAL SKETCH

The author is a native of Rockford, Illinois -- a three-sport letterman and a distinguished graduate of Auburn High School. He has a Bachelor of Science degree in Management from the United States Air Force Academy where he played baseball and football. Prior to attending AFIT, his first and only assignment was 23 months as the Laser Maverick Missile Program Manager on the $80 million AGM-65E RDT&E program. In this position he earned the basic missile badge and the Air Force Commendation Medal. He is now stationed at Los Angeles AFS, as a program/test manager on Satellite 14, the Defense Support Program.