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AN ANALYSIS OF THE SUPPORT EQUIPMENT ACQUISITION PROCESS AND METHODS DESIGNED TO REDUCE ACQUISITION LEADTIME

Thesis

Bradie Williams, GS-12

AFIT/GLM/LSY/91S-68

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AN ANALYSIS OF THE SUPPORT EQUIPMENT ACQUISITION PROCESS AND METHODS DESIGNED TO REDUCE ACQUISITION LEADTIME

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
Requirements for the Degree of
Master of Science in Logistics Management

Bradie Williams, GS-12

September 1991

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Preface

I would like to express my sincere appreciation to all the people, without whom, this thesis would not have been possible. First of all, I would like to thank the faculty at AFIT and in particular, my thesis advisor, Dr. Norman Ware, for his patience, time, and words of wisdom. I would also like to acknowledge the contributions of two other AFIT faculty members; Mr. Richard Andrews, an expert in the field of acquisition, whose comments were invaluable and Dr. Guy Shane, whose concern and guidance I will never forget. I am deeply appreciative for the assistance received from: 1) the F-16 SPO at Wright-Patterson AFB OH. (Mrs. Vanice Wells - the Peace Marble SE Program Manager and Mr. Gary Estep - the Peace Onyx SE Program Manager were not only very giving of their time and expertise, but also a real pleasure to work with); 2) the F-16 directorate at Hill AFB, UT.; and 3) employees at General Dynamics Corporation, Fort Worth, TX. Last, but by no means least, I dedicate this thesis to my daughter Amanda, who has always stood by me even though she has been without a true Father for the last eighteen months. For this, I am eternally grateful and proud of her.

Table of Contents

AFIT/GLM/LSY/91S-68

ABSTRACT

Support equipment acquisition leadtime continues to be a problem for both the United States Air Force and our foreign military sales programs. With the increasing number of support equipment line items, incremental complexity of new items, and their escalating associated costs, the acquisition and timely delivery of equipment in support of weapon systems in the field is imperative. As a microcosm of the entire Department of Defense acquisition process, support equipment is often, late to need, without a complete integrated logistics support package, of poor or unstable design, and frequently requires considerable interim support.

The purpose of this thesis is to look at the support equipment acquisition process from three perspectives: 1) from the overall weapon system acquisition process; 2) in the broad perspective of the integrated logistics support (ILS) concept; and 3) in the much narrower perspective of procuring organizations.

The objective of this thesis is to examine support equipment acquisition from the viewpoint of the procuring organizations, to identify problem areas in the process resulting in excessive acquisition leadtime, and to investigate alternative means of acquisition designed to

reduce leadtime while maintaining maximum support to the acquiring organization at minimum cost.

AN ANALYSIS OF THE SUPPORT EQUIPMENT ACQUISITION PROCESS AND METHODS DESIGNED TO REDUCE ACQUISITION LEADTIME

I. Introduction

Overview

Support equipment acquisition leadtime continues to be a problem for both the United States Air Force and our foreign military sales programs. With the increasing number of support equipment line items, incremental complexity of new items, and their escalating associated costs, the acquisition and timely delivery of equipment in support of weapon systems in the field is imperative.

Weapon System Acquisition Process. Department of Defense (DoD) acquisition management policies and procedures direct the acquisition of both major and non-major acquisition programs from the initial submission of a mission need statement through the full-rate production and operational support phase of the Defense system life cycle (17:11). The effectiveness of the acquisition program is largely determined by how adequately the implemented acquisition policy directs and controls the acquisition process in relation to the Defense Department's three major decision making support systems: 1) requirements generation;

2) acquisition management; and 3) planning, programming, and budgeting (16:15-27).

The requirements generation system is designed to produce information for decision makers on projected mission needs. Initially, mission needs are expressed in very broad operational terms and are progressively translated into system-specific performance requirements as the acquisition program evolves. These performance requirements are first introduced and periodically updated via the mission need statement (MNS) discussed in greater detail in Chapter II. Basically, a mission need statement enters the DoDs requirements system after it has been determined that a change in doctrine, tactics, training, or organization will not satisfy the need. The mission need statement is designed to fix shortcomings in existing materials, or to introduce new operational capabilities. These deficiencies are discovered as a result of continuing assessments conducted by the services and forwarded to the Joint Requirements Oversight Council (JROC) for review (16:16).

The acquisition management system is an event-driven acquisition process that explicitly links milestone decisions to demonstrated accomplishments. The streamlined acquisition management structure provides the basis for making informed trade-off decisions, given affordability constraints and mission needs. The acquisition management system also assesses the status of a program relative to the user's needs, the established program baseline, and the accepted acquisition strategy to formulate alternative concepts for fulfilling the mission need. Through an iterative process of review, a concept is eventually selected and a stable system design results.

The planning, programming, and budgeting system (PPBS) is designed to provide the basis for making informed affordability assessments and resource allocation decisions on each acquisition program. It is beyond the scope of this research to evaluate the planning, programming, and budgeting system. However, it should be recognized that in the beginning of an acquisition program affordability goals and resource commitments are made based on best estimates and are progressively refined into firm unit costs.

In the last three decades four major revisions to the acquisition policy have been initiated. In the 1960s, Secretary of Defense McNamara introduced a new organizational structure designed to centralize the decision making process and with the aid of Charles Hitch and Anthony Young established the Planning, Programming, and Budgeting System (PPBS) (12:19). In 1971 Secretary of Defense Packard introduced ten major policy elements to begin decentralization of responsibility and authority for acquisition management, and to reform the acquisition process. Secretary Packard also directed the publication of DoD Directive 5000.1, Defense Acquisition Programs, to catalog acquisition guidelines (28:2). In 1981 Secretary of Defense Casper Weinberger and his Deputy, Mr. Frank

Carlucci, again made major policy revisions to the acquisition process with their 32 acquisition improvement incentives. On 27 March 1981, a memo was sent to each of the service secretaries from the Secretary of Defense instructing them on the new policy of decentralized accounting, participative management (controlled decentralization), and the need to become more effective and efficient in DoD operations (12:19-20).

The most recent revision to the acquisition process began in 1986. The Goldwater-Nichols DoD Reorganization Act, the Defense Acquisition Improvement Act, and the Defense Management Report to the President all attempt to have the Defense community work as a team under the leadership of the Under Secretary of Defense for Acquisition [USD(A)] (6:9). In many respects the new management policy is a patchwork of the old acquisition policies. The new policy calls for teamwork, manager's participation, integrity, and accountability, all of which were a part of the Packard and Weinberger era. The new policy also calls for final approvals to be made by the Under Secretary of Defense for Acquisition which is similar to the 1960s when Defense Secretary McNamara made all the final decisions.

One major disadvantage of any policy change is that it takes time. As John A. Betti, former Under Secretary of Defense for Acquisition, pointed out "change is a continuous process, and the real results of our efforts may not be evident in major programs until more than a decade from now

(6:9)." Although having to wait a decade to see results may seem an exaggeration on Mr. Betti's part, it also seems to be justified by the dates of previous policy changes: 1960,1971, 1981, 1986. Regardless of the time frame, each policy revision changed much of the existing policy to attempt to more effectively control the acquisition process under the conditions then existing. Common to all policy revisions was the overall desire to improve the acquisition process by reducing acquisition cost and time while ensuring system readiness and increasing system sustainability.

Integrated Logistics Support Concept. As part of the above assessment of the Defense acquisition process, former Assistant Secretary of Defence Carlucci affirmed eight major acquisition management principles as the basis for the recommended changes. One of the eight priciples as stated was:

> Improved readiness is a primary objective of the acquisition process of comparable importance to reduced cost or reduced acquisition time. Resources to achieve readiness will receive the same emphasis as those required to achieve schedule or performance objectives. Include from the start of weapon system programs designed-in reliability, maintainability, and support. [7:1]

It has been recognized for some time that the integration of logistics elements into the overall acquisition process is desirable. This is readily evidenced by the prolific amount of documentation concerning integrated logistics support (ILS) and logistics support analysis (LSA).

Support Equipment Acquisition Process. Support equipment is one of the ten elements of the integrated logistics support system and as such requires the coordination and cooperation of many different Air Force commands. The roles and responsibilities of each Air Force agency concerned with the acquisition of support equipment (SE) is well defined and delineated. Air force Regulation 800-12, Acquisition of Support Equipment, identifies four primary commands which are responsible for the acquisition of support equipment: 1) Headquarters United States Air Force (HQ USAF); 2) Air Force Systems Command (AFSC); 3) Air Force Logistics Command (AFLC); and 4) the using command (21:5-7).

Support equipment acquisition policies, as outlined in AFR 800-12, are used to identify, configure, size (to determine optimum quantities, location, and mixes), select, develop, produce, control, and modify support equipment for Air Force and foreign military sales programs. The primary acquisition commands are responsible for minimizing the introduction of new support equipment, the need for support equipment development programs, and support equipment proliferation by advocating support equipment specification to design requirements rather than performance requirements (21:1). The commands are further required to ensure that the support equipment concept is established early in the program, is consistent with the operational and maintenance concepts, and is directed toward increased equipment commonalty and optimum use of standard or preferred items already in the DoD inventory (21:2).

The primary objective of AFR 800-12 is "to obtain, at fair and reasonable prices, support equipment which is absolutely necessary to field-supported weapon systems (21:1)." The secondary objective of AFR 800-12 is "to increase management awareness of the need to view support equipment as an integral element of weapon system acquisition and modification programs and follow-on support (21:1)." To obtain these objectives is an arduous task. To obtain these objectives while complying with all the support equipment acquisition policies is an extremely formidable task. To obtain these objectives while complying with all the support equipment acquisition policies, integrated logistics policies, weapon system acquisition policies, and expect them to always be available concurrent with the organic support function they were designed to perform with is very impetuous.

Too many acquisition programs and their associated logistical support are deployed late and over budget according to John A. Betti, former Under Secretary of Defense for Acquisition. To make matters worse, the equipment often does not meet the stated technical objectives. Mr. Betti continues to deride the amount of time necessary to complete an acquisition process by stating,

> a recently completed Navy study showed that by strictly following the existing acquisition process, it could take more than 23 years to go

> from identifying the need for a new weapon to initial deployment of the system. In an era when technology is doubling every several years, we can't afford to wait one decade, let alone two, to field new weapon systems. [6:9]

Government buying is not only huge, but it is highly decentralized. No one really knows for sure how much is bought by the government. However, for fiscal 1988, the General Services Administration (GSA) announced that the government spent $195 billion on goods, services, and research & development. Government and private sector analysts believe that these estimates often run 30 to 50 percent low (31:10). The system continues to grow and become increasingly complicated due to the fact that no other market exists for many of the government's purchases, particularly for Defense products. This means that there is no accepted way to reliably measure costs, prices, and profits. In 1988, almost 22 million contracts were approved or modified by 150,000 procurement officials in 5,000 contracting offices. Nearly 500,000 federal employees are actively involved in the writing of regulations, auditing and inspecting contracts, and assessing the government's procurement needs (31:11). As if this were not bad enough, the procurement process depends upon 4,000 laws and 30,000 pages of contracting regulations issued by 79 offices and overseen by more than 26,000 people, not to mention the 29 congressional committees and 55 subcommittees (32:22).

Is it any wonder that it takes far too long to develop and procure new weapon systems and their associated support equipment? Then, because of high unit cost, the government produces the system at very low and inefficient production rates. The overall effect is not only that new weapon systems and support equipment cost more than they should, but the government ends up modernizing its forces extremely slowly and often deploys new systems that have already become obsolete.

Problem Statement

Support equipment, as a microcosm of the entire Department of Defense acquisition process, is in general, late to need, often without a complete integrated logistics support package, of poor or unstable design, and often requires considerable interim support.

List of Key Terms

For the purpose of this research, the following terms and definitions shall apply. A list of additional terms and definitions is attached as Appendix A. A list of acronyms is also provided in Appendix B for the convenience of the reader.

Support Equipment (SE). 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 operation functions (21:11).

Mission Equipment (ME). Any item which is a functional part of a system or subsystem that is required to perform mission operations (21:10).

Common Support Equipment (CSE). An equipment item applicable to more than one system, subsystem, or item of equipment; has a national stock number (NSN) assigned to it; and is currently in the Department of Defense inventory (21:9).

Peculiar Support Equipment (PSE). An equipment item applicable to one system, subsystem, or item of equipment; an equipment item that is being introduced into the Air Force inventory for the first time; or a common support equipment item that has been reconfigured for a specific function or purpose (21:10).

Contractor Furnished Equipment (CFE). Items acquired or manufactured directly by the contractor for use in the system or equipment under contract (21:9).

Government Furnished Equipment (GFE). Items in the possession of, or acquired directly by the government, and later delivered to or otherwise made available to the contractor for integration into the system or equipment (21:9).

Support Equipment Recommendation Data (SERD). A contract deliverable document that lists recommended specific items of support equipment to support a weapon system or end item of equipment (21:11).

Foreign Military Sales (FMS). That portion of United States security assistance authorized by the Foreign Assistance Act of 1961, as ammended, and the Arms Export Control Act, as amended. Foreign military sales includes Department of Defense cash sales from stocks (inventories, services, training); Department of Defense guarantees covering financing by private or Federal Financing Bank sources for credit sales of defense articles and defense services; sales financed by appropriated direct credits; and sales funded by grants under the military assistance program (MAP) (13:B,10).

Acquisition Logistics (AL). The process of systematically identifying and assessing logistics requirements and alternatives, analysis, and resolution of integrated logistics support (ILS) deficiencies and the management of integrated logistics support throughout the acquisition process (2:1).

Integrated Logistics Support (ILS) Program. The integrated logistics support program provides management and technical activities a disciplined, unified, and iterative approach to integrate support requirements into system and equipment design; develop support requirements that are related consistently to readiness objectives, to design, and to each other; and acquires and provides the required support at an affordable life cycle cost (LCC). The objective of the ILS program is to field weapon systems and equipment that achieve the required readiness and sustainability posture at an affordable life cycle cost (24:1).

Logistics Support Analysis (LSA). Logistics support analysis is any analysis, however simple, that results in a decision on the scope and level of logistic support (25:2).

Program Manager (PM). The single Air Force individual designated by the implementing command who has authority and responsibility for managing the acquisition program. Integrated logistics support is a program management responsibility that the program manager assigns in whole or in part to the deputy program manager for logistics (DPML) or the integrated logistics support manager (ILSM) (20:1,2).

Deputy Program Manager for Logistics (DPML). An experienced logistician who is assigned to a major program office to assist in executing integrated logistics support responsibilities throughout the acquisition program (20:1,2).

Integrated Logistics Support Manager (ILSM). An experienced logistician who is assigned to a program not designated as a major program to assist in executing integrated logistics support responsibilities throughout the acquisition program (20:1,2).

Objectives of Research

1. Analyze the support equipment acquisition process as it relates to the overall Department of Defense weapon system acquisition process.

2. Analyze the support equipment acquisition process as it relates to the integrated logistics support (ILS) program and the logistics support analysis (LSA) concept.

3. Define the support equipment acquisition process as currently being implemented by the United States Air Force.

4. Identify those areas of the support equipment acquisition process that are causing delays in the delivery of support equipment for fielded weapon systems.

5. Determine areas of the support equipment acquisition process that can be improved to reduce acquisition leadtime for the delivery of support equipment for fielded weapon systems.

Research Questions

1. What are the major problem areas in the support equipment acquisition process and what can be done to either alleviate them or lessen their impact on support equipment delivery?

2. What contracting, procurement, or management strategies exist or could be implemented to help the logistics manager or acquisition manager reduce leadtime for the delivery of support equipment for fielded weapon systems?

3. What additional problem areas of support equipment acquisition exist when dealing with foreign military sales (FMS) programs? What can be done to alleviate or lessen these problems?

Scope of Research

Assumptions.

1. The interviews were conducted in such a manner as to not intimidate the interviewee or coerce the interviewees' responses.

2. The interview questions were constructed in such a way as to not bias the individuals' responses.

3. Answers provided are honest and based on the knowledge and experience of each respondent.

4. The responses obtained from the persons interviewed are characteristic of the organization they represent.

Limitations.

1. The scope of this research will be restricted to the interaction of acquisition logistics, integrated logistics support, and the logistics concerned with the delivery of support equipment for the F-16 weapon system as they apply to the United States Air Force and foreign military sales programs.

2. The term support equipment, as employed in this thesis, will apply only to items considered common or peculiar to the F-16 weapon system, contractor or government furnished, and used in either the organizational, intermediate, or depot level of maintenance arena.

3. No attempt will be made to consider future ramifications of the merger of Air Force Systems Command (AFSC) with Air Force Logistics Command (AFLC). This thesis will continue to consider the two commands as separate, but interrelated, each with its own structures, internal procedures, and individual policies or goals.

Organization of the Study

The research study will be presented in the remaining seven chapters. Chapter II will examine the support equipment acquisition process as it is related to the overall weapons system acquisition process. Chapter III will evaluate support equipment acquisition from the general viewpoint of the integrated logistics support program. Chapter IV will explore support equipment acquisition as it applies to the four primary organizations having responsibility for the procurement of support equipment, with special emphasis on Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC). Chapter IV will further examine the key decisions and documents required to assure parallel or concurrent support equipment development and eventual deployment with the weapon system being acquired.

Chapter V will examine the research methodology used for this thesis, including the interview instruments, procedures, and selection of persons to be interviewed. Chapter VI will provide an in-depth analysis of these interview responses as they relate to the current acquisition process as perceived by logistics/acquisition personnel interviewed.

Chapter VII will discuss problems in the acquisition process and methods to improve them as recommended by support equipment managers and item managers interviewed. Chapter VIII will provide an overview of the research objectives, discuss the findings for each, and attempt to form conclusions, make recommendations, and suggest further studies for each research objective.

II. Support Equipment as an Element of Weapon System Acquisition

Definition of Acquisition Logistics (AL)

The weapon system acquisition process is a myriad of decision events and phased activities orchestrated in such a manner as to achieve the program objectives set forth in the mission need statement (MNS) and extending through system deployment. Acquisition logistics is the universal driver of the policies, concepts, and philosophies used to design, develop, and deploy weapon systems to the field.

AFLC/AFSC Pamphlet 800-34, Acquisition Logistics Management, defines acquisition logistics as:

> The process of systematically identifying and assessing logistics requirements and alternatives, analysis, and resolution of integrated logistics support (ILS) deficiencies, and the management of ILS throughout the acquisition process. [20:1,1]

According to the above definition, acquisition logistics differs from integrated logistics support in that acquisition logistics ends at time of system deployment (completion of acquisition process) and the integrated logistics support program (as will be shown in Chapter III) continues throughout the life cycle of the system.

Weapon System Acquisition and Systems Theory

Another key word in weapon system acquisition that needs to be defined at this time is the concept of a "system". A system is defined as:

> (1) a set of (2) objects (3) together with relationships (4) between the objects and between their attributes (5) related to each other and to their environment (6) so as to form a whole. [47:4]

This definition is broken down into six areas which need further definition or explanation. The idea of a set simply means a collection of items having some type or form of relationship or commonality. Second, each object or item of a set should be identifiable with the set it is associated or used with. Systems are made of up of any number of items, but each item can be classified as an input, process, or output: 1) inputs are those items or resources used by the system which allow it to function; 2) processes or transforms inputs into outputs; and 3) outputs are considered to be what the system was designed to perform or produce.

Relationships was the third term in the definition of systems. Relationships are the bonds formed between the objects of the system and are either symbiotic, synergistic, or redundant: 1) symbiotic is where one or more objects in a system rely on each other for survival or operation; 2) synergistic is where the combined action of all objects produce results which are greater than expected from the parts taken individually; and 3) redundant relationships are, as the term, implies backup objects designed to increase reliability.

The fourth term requiring further definition is attributes. Attributes are the parameters or characteristics of an object or relationship. For example if an attribute is established requiring a minimum flight time of four hours, the resulting impact on a fighter aircraft system may be a need to increase the size of the fuel cells.

The fifth term in the systems definition is environment. Environment, in the systems concept, consists of everything which affects the system, but is outside the control of the system. The last term requiring further definition is the term whole and is probably the most difficult term to define or understand the resulting impacts from. A system is made up of any number of objects, as stated previously, but must work together as a unified structure. Because of the objects relationships, attributes, and environment, there are numerous interrelationships and interdependencies formed. Any change in a set, object, relationship, or attribute can cause an entirely new set of interrelationships and interdependencies to be formed, thus affecting the system as a whole.

When the weapon system acquisition process is looked at, in relationship to the systems theory concept, one requirement should stand out as absolutely essential; integration is mandatory! Integration is, as one dictionary defines it, "1) the act or an instance of combining into an integral whole. 2) behavior in harmony with the environment (41:692)." In weapon systems acquisition, with numerous commands and activities involved (each with its own policies and established procedures), ten or more elements of support to consider, political ramifications, and budgeting criteria, integration is of the essence to field an operational and supportable weapon system.

It is beyond the scope of this thesis to delve too deeply into systems theory, but a listing of the five basic characteristics of systems should prove beneficial when looked at from the weapon system acquisition viewpoint. The five characteristics of systems are (47:7): 1) all systems have objectives and some measure of performance; 2) all systems operate in a specific environment; 3) all systems have resources; 4) all systems are made up of components or elements; and 5) all systems have some type of management. It should be quite evident that all five characteristics are applicable in the acquisition process.

Weapon System Acquisition Process

The weapon system acquisition process is made up of five distinct acquisition phases. Each phase, beginning with the concept exploration and definition phase through the operation and support phase, has a distinct purpose and goal which must be met. This research paper will only be concerned with the first four phases. The successful completion of each phase is marked by a milestone decision.

Appendix C provides a listing of all milestone decisions, criteria, and required documents as outlined in DoDI 5000.2. The milestone decisions signify the end of one acquisition phase and the beginning of another. The specific procedures and required documentation for each of the acquisition stages and associated milestones are specified in DoDI 5000.2, Defense Acquisition Program Procedures and DoDI 5000.2M, Defense Acquisition Management Documentation and Reports.

It is beyond the scope of this thesis to attempt to review the entire weapon system acquisition process as outlined in the 1000 plus pages of DoDD 5000.1, DoDI 5000.2, and DoDI 5000.2M. However, a brief outline of the acquisition process will be given to assist in the understanding of the process and how it relates to support equipment acquisition.

Weapon system acquisition programs developed by the Department of Defense range in size from small, relatively low dollar value, to very large expensive programs. This thesis will concentrate primarily on "major" weapon system acquisition programs. According to DoDD 5000.1, Defense Acquisition, a major acquisition program is one that: 1) has been designated by the Under Secretary of Defense for Acquisition [USD(A)] as a major defense acquisition program; 2) has an estimated total expenditure for research, development, test, and evaluation (RDT&E) of more than $300 million in fiscal year 1990 constant dollars; or 3) has an eventual total expenditure for procurement of more than $1.8 billion in fiscal year 1990 constant dollars (16:2). However, the same principles apply to all acquisition programs to varying degrees.

The process begins with an identification of a mission need. The entire purpose of the acquisition process is to satisfy the shortcomings in operational capability. The major Air Force commands are continually involved in mission need analysis to identify deficiencies in current and future systems in order to counter perceived threats. If a threat is identified which can not be dealt with by utilizing an existing system, a mission need statement (MNS) is prepared by the major command. The mission need statement is coordinated with AFSC and AFLC, and sent to HQ USAF for further review. HQ USAF reviews the mission need statement and major command comments, and determines whether an acquisition program is necessary. If a new acquisition program is justified, the request is submitted to the Joint Requirements Oversight Council for validation and the assignment of a priority. Validation of the mission need is accomplished by determining that a nonmaterial solution (e.g., a change in doctrine, operational concepts, tactics, training, or organization) will not satisfy the identified mission need criteria. Once the Joint Requirements Oversight Council has validated the need for a new major Defense acquisition program, a joint service priority code will be assigned, and the mission need statement is forwarded to the Defense Acquisition Board as part of the Air Force's annual Program Objective Memorandum (POM) to request funding.

Final approval of the mission need statement rests with the Under Secretary of Defense for Acquisition [USD(A)] as Chairman of the Defense Acquisition Board (DAB). The review and decision point at this time is called Milestone 0 or concepts study approval. It marks the first true interface between the requirements generation system and the acquisition management system. Once the Under Secretary of Defense for Acquisition has issued an acquisition decision memorandum (ADM) the concept exploration and definition phase, Phase 0, of the acquisition process begins. The acquisition decision memorandum also accomplishes three other efforts: 1) it directs studies of alternative material solutions; 2) designates one or more military departments to conduct the studies; and 3) identifies a source of funding (16:19).

Milestone decision points, see Appendix C, occur at critical times or junctions of the acquisition program and require the complete integration of all three Defense management systems: 1) requirements generation system; 2) acquisition management system; and 3) planning, programming, and budgeting system. At each milestone decision point, the milestone decision authority, as designated by the Under Secretary of Defense for Acquisition [USD(A)] (16:20-21):

> 1. Assesses the status of the program relative to the user's needs, the established program baseline and acquisition strategy, approved exit criteria

from the previous milestone, and approved financial plans.

2. Evaluates the updated acquisition strategy and the plans for conducting the next phase and managing risk.

3. Makes cost-performance-schedule trade-offs, assesses the affordability of what is being proposed, and determines if the program should be terminated, redirected, or allowed to continue into the next phase. For those programs receiving a go-ahead, the decision authority establishes:

a. A refined program baseline for the next phase containing appropriate objectives and thresholds for cost, schedule, and performance; and

b. Program-specific accomplishments, called exit criteria, that must be satisfied during the next acquisition phase.

Also, the Joint Requirements Oversight Council (JROC) plays a major role in the milestone reviews. The Joint Requirements Oversight Council (16:20-21):

1. Confirms that the mission need is still valid.

2. Confirms that the proposed performance objectives and thresholds satisfy the need given a validated threat assessment.

3. Provides recommendations on proposed cost-performance-schedule trade-offs based on affordability, technological constraints, interoperability, and overall program progress.

A decision to proceed at Milestone 0, marks the beginning of the concept exploration and definition phase. It should be recognized that a decision to continue at this point does not establish a new acquisition program, but merely reflects approval to proceed with studies of alternative concepts.

<u>Concept Exploration and Definition Phase</u>. The concept exploration and definition phase, often referred to as the

conceptual phase or Phase 0, is primarily concerned with the identification and exploration of alternative solutions to meet the validated threat identified by the major commands. Once proper funding has been allocated against the program (at Milestone 1), the program management directive (PMD) is issued. As mentioned earlier, this phase of the acquisition process constitutes a study, not a new program. Proper funding for the study may come from reprogramming, budget amendment actions, or study funds controlled by one or more of the Department of Defense components (16:19). The program management directive (PMD) is developed in response to a mission need statement or other documentation defining the deficiency and providing options or recommended solutions. HQ USAF issues the program management directive, after endorsement by the Under Secretary of Defense for Acquisition [USD(A)], to provide guidance and direction to the implementing, participating, supporting, and operational commands. The program management directive is used throughout the entire acquisition cycle to state requirements and request studies, as well as to initiate, approve, transfer, and eventually end programs (20:6-1).

The major activity during the conceptual phase is the establishment of the technical, military, and economic bases for the program through system feasibility studies. A major part of the concept exploration and definition phase is the establishment of the acquisition strategy (AS). The acquisition strategy is the overall plan for the system acquisition and defines the program objectives for the program manager. It encompasses technological options, test and evaluation criteria, schedules, industrial base/competition considerations, strategies, contracting options, logistics support, and manning/training requirements. The major outcomes of the conceptual phase is the determination of whether or not the program should continue. The major documents developed during the conceptual phase, that affect support equipment acquisition, are the integrated program summary (IPS), the program management plan (PMP), each discussed later in this chapter, the acquisition decision memorandum (ADM), and the operational requirements document (ORD).

The program management plan (PMP) is the principle program management baseline document used by participating agencies and high level decision authorities and is developed by the program manager. The program management plan (PMP) shows program objectives as well as the integrated time-phased activities and resources required to perform the task specified in the program management directive (PMD). This plan documents the approach for life cycle cost (LCC) management, which is a program management responsibility during all phases of the acquisition process. The objective of the program management plan (PMP) is to make sure the Air Force acquires products which provide cost-effective solutions to satisfy our operational requirements (20:9,1). A critical element of the program management plan is the initial examination of the integrated logistics support (ILS) concept. Included in the integrated logistics support concept is the preliminary analysis of support equipment alternatives.

The preliminary support equipment alternatives must be described, analyzed, evaluated, or deferred during the conceptual phase. Each program should require a support equipment development plan and a support equipment acquisition plan. An important point to remember is that the system design is extremely uncertain, and the support equipment alternatives are dependent upon the system engineering decisions. Regardless of the uncertainty of design, this is the first area that should begin to reflect the Air Force policy of standardization and the use of common support equipment. The support equipment requirements list must be communicated to the potential contractors in the form of solicitation documents. The solicitation document, currently used by the F-16 system program office (SPO), is the request for proposal (RFP) which is sent to industry later in the weapon system acquisition process. This request for proposal must be submitted to the contractors as early as possible in the system development to ensure timely delivery of support equipment.

The request for proposal (RFP) is structured in such a way as to encourage competition and innovation by all responding contractors. The contents focus mainly on the operational needs to be resolved, cost and schedule thresholds, operating environment, and performance and logistics supportability issues. Since the request for proposal (RFP) focuses on the performance and technical requirements of the system being defined, and because the system is still in the conceptual phase of development, support equipment is seldom considered. Once the request for proposal is completed, a copy is distributed to industry to solicit responses to satisfy mission needs. After a predetermined amount of time, the proposals are received and evaluated by a source selection authority (SSA), and the best alternative(s) chosen. The evaluation is based upon cost, schedule [illegible]chnical performance of the system, and to the extent po[illegible]sible at this time logistics supportability.

The program executive officer (PEO) and the program manager (PM) prepares an integrated program summary (IPS), which is a summary of the concept exploration and definition phase. It describes the concept that is to be carried into the next phase, the acquisition strategy, reasons for the elimination of alternate concepts, program goals/objectives, and thresholds to be achieved in the next phase. The initial version of the test and evaluation master plan (TEMP) is also published at this time. The test and evaluation master plan restates much of what is published in the integrated program summary (IPS), but also includes an integrated schedule for contractor demonstration, evaluations (preliminary and technical), as well as establishes standard and operational test and evaluation milestones. The test and evaluation master plan also attempts to list all resources required, which may include laboratories, ranges, instructions, and logistics support. Both the integrated program summary (IPS) and the test and evaluation master plan (TEMP) are reviewed and updated at each milestone decision point throughout the remainder of the acquisition process. The integrated program summary is reviewed by the Defense Acquisition Board (DAB). The Defense Acquisition Board is an advisory council established by the Secretary of Defense (SECDEF) and chaired by the Under Secretary of Defense for Acquisition [USD(A)], to appraise the SECDEF of the program status and readiness of a major defense system prior to proceeding to the next phase of the acquisition process. The Defense Acquisition Board (DAB) reviews the progress of the program to this point, and provides a recommendation to the Under Secretary of Defense for Acquisition [USD(A)] whether to proceed to the next phase. This recommendation to the Under Secretary of Defense for Acquisition is called an integrated program assessment (IPA) and may be prepared at anytime during the acquisition process. Unlike the integrated program summary (IPS), the integrated program assessment (IPA) may be issued at times other than milestone decision points if requested. Both the IPS and the IPA are prepared in the same format.

Once the Under Secretary of Defense for Acquisition [USD(A)] has received the updated integrated program assessment (IPA) and performed his evaluation of the program, he will make the decision of whether to continue or discontinue the acquisition program. This decision will be presented to the Secretary of Defense in the form of an updated acquisition decision memorandum (ADM). An affirmative decision by the Secretary of Defense constitutes the Milestone 1 decision, concept demonstration approval. This concludes the concept exploration and definition phase and starts the demonstration and validation phase of the weapon system acquisition process.

Demonstration and Validation Phase. With the selection of alternative methods to satisfy the operational need, the demonstration and validation phase, Phase I, is concerned with refining alternatives. The refinement process is accomplished through extensive studies and analysis, possible hardware development, and limited test and evaluations. The objective of this phase is to reduce the technical risk and the cost associated with each alternative while at the same time re-validating the threat. The ultimate goal is to decide on one or more solutions, and decide which alternative, if any, will proceed into the engineering and manufacturing development phase. A selection of an appropriate alternative is accomplished in three ways.

The first method is by design definition "paper" studies. In this approach, the system program office (SPO) compares paper products; system specifications, definition of performance requirements, initial hardware configuration, refined cost estimates and current schedule projections. A source selection board (SSB) evaluates and selects the best proposed solution.

A second method of selecting a design alternative is through system prototyping. Each contractor selected begins a prototype fabrication phase, which will allow for the system performance objectives to be met. The fabrication need not resemble the final operational system, but the performance characteristics must be met in order to compare the competing systems. At this point, the systems are compared, or possibly in the case of aircraft a "fly-off" is conducted to select the best system design(s). The third method is a combination of the first two methods, design definition and system prototyping.

During the demonstration and validation phase, the preliminary integrated logistics support plan (ILSP) is prepared. The integrated logistics support plan is a task oriented plan which specifies the development, test, and eventual evaluation of the contractor's support elements, including support equipment. Also, a baseline schedule must be included detailing the integration of the contractor's support elements, including support equipment considerations.

As the system begins to develop and mature, so does the definition of the support equipment. The proposed support equipment becomes one more factor upon which to evaluate the system, and can at times influence the final system design choice. During the demonstration and validation phase, the proposed support equipment must be continually analyzed and trade-offs must be made. The requirements must be continually evaluated against the different alternatives due to high cost of developing and acquiring support equipment. Careful consideration must be given to the different levels of support equipment. Each type of support equipment has different development leadtimes and require varying levels of management.

AFR 800-12, Acquisition of Support Equipment, defined five different types of support equipment prior to 1985. Currently, only two types are considered (peculiar/developmental and common), which in turn encompass the five earlier types. It is important to consider each type of support equipment during the development process, because of the different leadtimes and costs.

The first type of support equipment is prototype support equipment. Prototype support equipment is usually peculiar to the system it supports, and is very expensive. Prototype support equipment, must be developed simultaneously with the development of the mission system because of the high technological interfaces, long leadtime for development, and an early requirement date for support. Prototype support equipment is sensitive to the design changes in the system, and requires intensive management attention by AFSC, supported by AFLC and the using command.

Management attention is extremely important due to the significant impact it has on the operating system readiness and support costs. During the demonstration and validation phase, it is not unusual to have development and test of a piece of prototype support equipment. Often times the support equipment must evolve as the system hardware develops.

The second type of support equipment is early developmental equipment. Early developmental support equipment is identical to prototype equipment except that it is developed independently of the operational system. As a result, early development support equipment is not extremely sensitive to design changes in the operational system.

The third class of equipment is the deferred development support equipment. This class of support equipment is highly sensitive to system design changes, but the development leadtime is relatively short. Therefore, the development of this support equipment is deferred until the design of the operational hardware is stable. Other alternatives, such as "work around" methods, contractor support, or less effective equipment, is utilized until the deferred support equipment is delivered.

The fourth type of equipment is normal development and common support equipment. This class represents most of the items required to support new defense systems. These items do not have high development and acquisition costs, and the sensitivity to system design changes or leadtime requirements, is minimal.

The fifth and final type of support equipment is special test equipment (STE). Special test equipment is developed or acquired for the principal purpose of maintaining quality assurance over the prime system during development or production. Special test equipment is used mainly on the production line in the contractor's plant, and later turned over to AFLC to be used for depot repair level capability once the system production is concluded. All the above types of support equipment, except type four, are considered as peculiar or developmental and are managed by AFSC. Type four, normal or common support equipment is managed by AFLC.

It should be pointed out that there is often a misconception, even among organizations highly involved in support equipment logistics/acquisition, about what constitutes peculiar and developmental support equipment. As has been previously stated, peculiar support equipment (PSE) is an equipment item applicable to one system, subsystem, or item of equipment. Developmental support equipment (DSE), as the term implies, is equipment currently being developed, designed, modified, or reconfigured to meet a need. Thus, developmental support equipment, once produced, may become either peculiar or common support equipment. HQ AFSC is the managing organization for all developmental support equipment. Once the developmental support equipment has been produced, stabilized into the Air Force inventory as peculiar or common support equipment, then program management responsibility is transferred to HQ AFLC.

On a system level, the demonstration and validation phase is concluded once the alternative solutions have been validated and demonstrated, and the technical, cost, supportability, and schedule risk have been identified. Once the contractor(s) is selected the integrated program summary (IPS) is reviewed, updated if required, and coordinated up the chain of command to the Defense Acquisition Board (DAB). The Defense Acquisition Board prepares the integrated program assessment (IPA) report to the Under Secretary of Defense for Acquisition [USD(A)] for the Milestone II decision, development approval, and the updating of the acquisition decision memorandum (ADM) for the Secretary of Defense. This is considered the major decision point in the weapon system acquisition process because a positive decision to proceed at this point almost always guarantees a production decision. An affirmative decision by the Secretary of Defense signals the end of the demonstration and validation phase and the beginning of the engineering and manufacturing development phase. This is the phase when the system design begins to take shape as well as the logistics support concepts.

Engineering and Manufacturing Development Phase. Once the system design has been validated and the logistics concept chosen, the acquisition process progresses into the engineering and manufacturing development phase, Phase II. Engineering and manufacturing development demonstrates the ability of a system to satisfy the defined mission need in the areas of cost effectiveness, reliability, maintainability, and operational supportability. During this phase, the operational and support system is designed, fabricated, tested, and evaluated. The engineering and manufacturing development phase marks the beginning of system testing and it's goal is to produce a fully tested, preproduction system. Another result of this phase is the development of all engineering documentation necessary to enter the production phase. Also the test results are used to determine if the system meets the operational requirements originally specified. The engineering and manufacturing development phase can be broken down into three overlapping subphases: engineering, prototype, and pilot production.

The engineering subphase establishes system attributes such as reliability, maintainability, and supportability. This is accomplished through the iteration of the design-build-test-redesign steps and the evolution of engineering development models. These models are used to demonstrate the system's sustainability and ability to meet mission needs under operational conditions. This phase defines the engineering parameters and verifies the accuracy of the system prototype.

The prototype subphase consists of a build-test-modify-redesign-build-test iteration that refines the previous subphase developmental system. This phase will provide system components for a technical evaluation. The results of this evaluation will provide the basis for final design considerations. Further, critical process specifications, quality assurance procedures, inspection procedures, rework philosophy, and any other instructions necessary for the fabrication of pilot-production models are defined during this subphase.

The pilot production subphase initiates the production of the hardware and software designs through the developed test equipment, hardtooling, and production processes in an actual production environment. It provides a basis for the evaluation of the system production, and identifies system strong points and faults. Appropriate actions are initiated during this phase to correct any weaknesses found in the production process.

The major support equipment development planning begins in the engineering and manufacturing development phase with the issuing of the development contract. Usually the support equipment development contract is included as part of the larger system development contract. Occasionally, contracts are issued with other contractors for the development of support equipment. The support equipment development contract has three main provisions. It specifies the support equipment requirements, the different alternatives, and the contractors management structure.

Upon issuance of the developmental contract, the prototype and early development support equipment efforts must be initiated in order to have support equipment to support testing and the initial deployment of the system. This support equipment must be developed in the engineering and manufacturing development phase because of the long development leadtimes, and the dependence on the system design. Temporary special test equipment (TSTE) is also fabricated during this phase as a means of "gearing up" for the production phase. The fabrication of deferred development and normal/common support equipment is delayed until the production phase. This equipment may be delayed because the development leadtimes are relatively short, and the final support equipment design is not dependent upon the system maturity.

In terms of the operational system, once the final design is stable, and the test results determine that the system(s) meet the stated operational effectiveness, the engineering and manufacturing development phase is complete. In the case of dual development up to this phase, a decision is made concerning which system to bring into the production and deployment phase. The integrated program summary (IPS) is once again updated, and the approval cycle begins once again. However, occasionally the production decision is delegated to the Secretary of the Air Force, provided the program is proceeding on schedule (time and cost). The selection of the desired system by the Secretary of the Air Force (or the Secretary of Defense when necessary) to proceed into the production and deployment phase constitutes the Milestone III decision, production approval, and signifies the end of the engineering and manufacturing development phase. Now the proven system and its associated logistical elements will be produced and delivered to the using command.

Production and Deployment Phase. The production and deployment phase, Phase III, includes the production of all system hardware, spare, support equipment, data, software, etc. During the production and deployment phase, all hardware is verified against the specification requirements and the production engineering efforts are executed. The logistics support resources are also verified much in the same way as the system hardware. The system and the logistics elements are produced and acquired in accordance with the requirements of the production contract.

This signifies the high point of the weapon system acquisition process, the production items are delivered and used by the operational units. Turnover is the act by which the using command officially accepts responsibility for the system from the implementing command.

During the production and deployment phase, the support equipment production and deployment proceeds concurrently with the system deliveries. The deferred development, normal or common development support equipment and the special test equipment (STE) which was delayed in the engineering and manufacturing development phase is produced. The goal is to develop the support equipment in time to be deployed with the operating system. Only through these efforts will the weapon system be totally supportable by the Air Force, without contractor support, at turnover. In the production and deployment phase, the test, operational, and support plans and resources are evaluated for achievement of their prescribed goals. An important goal of this phase is to continue to evaluate the system and its support elements to assure the initial operating goals are met, and the threat satisfied. All engineering deficiencies identified must be evaluated and corrected, and careful attention must be given to the impacts on the support equipment and the other logistical support elements.

Once the production phase is essentially complete, and the system has matured, the management responsibility is transferred from the implementing command (AFSC) to the supporting command (AFLC). This process is officially known as Program Management Responsibility Transfer (PMRT). All items concerned with the system will also have responsibility for their program management transferred, including the support equipment, technical data, spare parts, and more (27:2). This marks the end of the weapon system acquisition process.

Summary of the Weapon System Acquisition Process

The weapon system acquisition process is an infinite number of decision events and four phased activities orchestrated in such a manner as to achieve the program objectives set forth in the mission need statement (MSN) and extending through system deployment. Acquisition logistics is the ecumenical driver of the policies, concepts, and philosophies used to design, develop, and deploy weapon systems to the field. Thus, the major weapon system acquisition, as outlined in DoDD 5000.1 and DoDI 5000.2, is a phased process which integrates life cycle cost management, integrated logistics support, and the planning, programming and budgeting system procedures to provide an efficient, cost effective, and timely acquisition of a weapon system.

III. Support Equipment as an Element of Integrated Logistics Support

Definition of Integrated Logistics Support (ILS)

Chapter II provided the reader a definition of acquisition logistics (AL) and part of that definition mentioned the term "integrated logistics support (ILS)". While acquisition logistics covers only logistics planning during the formal acquistion process, integrated logistics support begins prior to formal acquisition and continues until the retirement of the system from service. "ILS differs from acquisition logistics in that ILS is a 'cradle to grave' process (2:1)."

According to DoD Directive 5000.39, Acquisition and Management of Integrated Logistics Support for Systems and Equipment, the integrated logistics support (ILS) program is described as:

> A disciplined, unified and iterative approach to the management and technical activities necessary to:
>
> a. Integrate support considerations into system and equipment design.
>
> b. Develop support requirements that are related consistently to readiness objectives, to design, and to each other.
>
> c. Acquire the required support.
>
> d. Provide the support during the operational phase at minimum cost. [14:2,2]

What exactly does this definition mean in regards to weapon systems acquisition? First, it requires the integrated logistics support (ILS) process to be tenaciously applied (disciplined). No two weapon system acquisitions are alike and no two integrated logistics support programs in support of those acquisition programs will be alike. However, all ten elements of the ILS program must be evaluated for program applicability. Second, the definition of ILS implies an uncompromising need for the ILS process to be managed as a single entity (unified) regardless of the number of ILS elements involved. This mandate for single entity management is of paramount importance to a weapon system acquisition where a change in one of the ILS elements can drastically affect other elements. Also inherent in this definition is the need for periodic and systematic reviews as the program progresses (iterative). Weapon system acquisitions are extremely dynamic and, as such, there is a requirement to evaluate all changes and establish their impact on the ILS program elements. Through this disciplined, unified, and iterative process items influencing the acquisition program, either internal or external to the program, may be evaluated for impact and the ILS program revised to ensure minimal disruption and expense (either time or money) to the program (35:4).

The integrated logistics support (ILS) function is the AFSC program manager's (PMs) responsibility until program management responsibility transfer (PMRT). In major system acquisition programs, the program manager will usually assign or delegate integrated logistics support responsibility to the deputy program manager of logistics (DPML) or in smaller programs the integrated logistics support manager (ILSM).

Integration and Tailoring

It was mentioned earlier that no two acquisition or integrated logistics support (ILS) programs are exactly alike. Each program is tailored to define, plan, optimize, and implement support resources. Tailoring involves "analyzing the support environment, assessing potential opportunities, formulating general objectives, and specific planning actions to attain these objectives (45:25)." Conversely, integration begins with tailoring, because through the tailoring process the support requirements for a product are defined. Once the support requirements are defined, integration of the supporting elements and procedures attempts to achieve the objectives defined in the tailoring process. A few of the tailoring techniques available are: 1) time and resources available; 2) cost versus benefit; 3) design freedom; 4) past experience; 5) policy directives; 6) work already accomplished; and 7) product criticality (45:25).

Four Functions of the ILS Program

According to the definition of integrated logistics support (ILS) above, there are four functions or operations the ILS program performs (35:4). In regards to logistics support they mean:

a. During the development phase of the acquisition process, or even earlier if possible, emphasis must be placed on designing-in those capabilities which improve or enhance logistics support.

b. During the development of the logistics support package, it is of paramount importance that the combination of ILS elements be selected that will maximize system readiness at a minimum life cycle cost.

c. Because industry plays a major role in weapon system acquisition, it is essential that all the logistical requirements of the program be translated into contractual requirements. Of even greater concern is that the logistician ensures that these contractual requirements be met.

d. Once a system is fielded, deficiencies are bound to exist that must be corrected through follow-on actions. Modifications to the system will occur during the life cycle of the system, requiring additional ILS planning.

Integrated Logistics Support Elements

DoD Directive 5000.39, Acquisition and Management of Integrated Logistics Support for Systems and Equipment, provides for ten integrated logistics support (ILS) program elements which form the basic elements of a weapon system's total support capability. Each element is interrelated and interdependent with one or more of the other elements, as well as with the weapon system design. These ten elements subdivide the ILS program into manageable functional areas and disciplines. It should be noted that additional elements may be added if the program requires other areas of support that are not provided for under the normal ten elements. AFR 800-8, Integrated Logistics Support (ILS) Program, listed fifteen ILS elements until its revision in March 1986 to coincide with DoD Directive 5000.39 (26:9). See the definition for integrated logistics support elements (Appendix A), for a listing and brief explanation of each of these ten ILS elements.

Support Equipment: Element Number Four of the ILS Program

Logistics support must be a major consideration in the weapon system acquisition process. DoD Directive 5000.1, Defense Acquisition, states "logistics supportability shall be a design requirement as important as cost, schedule, and performance (16:15)." AFR 800-8, Integrated Logistics Support (ILS) Programs, defines support equipment as:

> All equipment (mobile or fixed) required to support the operation and maintenance of a weapon system, except that which is an integral part of the mission equipment. This includes associated multi-use end items, ground handling and maintenance equipment, aircraft battle damage repair kits, tools, metrology and calibration equipment, test equipment, modular automatic test equipment (MATE), and automatic test equipment (ATE) (when ATE is used in a support function), SE for on and off-equipment maintenance and related computer programs and software. It also includes special test equipment (STE) used during testing, and manufacturing that can be reclassified and delivered as support equipment. [26:11]

Although this definition of support equipment (SE) is similar to the definition provided in Chapter I, it should be quite evident that SE from an integrated logistics support (ILS) viewpoint covers a much wider range of SE than will be discussed in this thesis. Because the SE element of ILS covers such a broad range, it is mandatory that SE strategy and planning requirements be developed as early in the acquisition process as feasible to ensure delivery concurrently with the system or equipment it is required to support.

Integrated Logistics Support and Life Cycle Cost

Integrated logistics support (ILS) has become more and more important to the Air Force as advances in technology have been made and weapon systems have become increasingly complex. Associated with the increased complexity of weapon systems is the inherent incremental complexity of new items of support and their escalating associated costs. The DoD has found that the most cost effective approach is to design weapon systems with support in mind as early in the acquisition process as possible with total life cycle cost considered.

Life cycle cost (LCC) is defined in AFR 800-8, Integrated Logistics Support (ILS) Program, as:

> The total cost of an item or system over its full life. It includes the cost of the acquisition, ownership (operation, maintenance, support, etc.) and disposal. [26:31]

Establishing ILS during the concept exploration and definition phase of the weapon system acquisition process is compulsory if life cycle costs are to be considered. Studies have shown that, by the end of the systems concepts studies, 70 percent of the decisions defining total life cycle cost have been made, 85 percent by the end of the system definition, and 95 percent by the completion of engineering and manufacturing development (1:10-3). These percentages do not represent actual expenditures, but infer future spending commitments made because of the supportability design decisions that were made. It should also be noted that once these decisions have been made, it is almost always cost prohibitive to change them at a later date.

Integrated Logistics Support Plan (ILSP)

To ensure the early development of support equipment (SE) strategy and planning requirements, the accountable program management activity is assigned the responsibility of preparing the integrated logistics support plan (ILSP) during the concept exploration and definition phase of the weapon system acquisition process . The integrated logistics support plan is the principal logistics document for an acquisition program, is tailored to the specific needs of each program, and is designed to be used as a daily working document. The integrated logistics support plan (ILSP) begins during the concept exploration and definition phase as an objective-oriented document and progresses as the acquisition process progresses to more specific tasking and milestone scheduling. The ILSP is initially incorporated into the Program Management Plan (PMP) as Section 9, Logistics, and acts as the government's document which describes and documents the integrated logistics support (ILS) program.

The integrated logistics support plan (ILSP) must be a dynamic functional tool for developing and implementing a logistics support capability for new system or equipment acquisitions. The key word here is "dynamic". Just as the integrated logistics support (ILS) program was required to be managed using a disciplined, unified, and iterative approach the ILSP must also be maintained in such a manner.

Integrated Support Plan (ISP)

Just as the integrated logistics support plan (ILSP) is the governments' document, the integrated support plan (ISP) is the contractors' document. The preliminary integrated support plan is originally requested from a contractor as part of the offeror's request for proposal (RFP). This document is designed to establish the responsibilities of the contractor under the integrated logistics support (ILS) program and the means for his accomplishment of the ILS objectives. The integrated support plan (ISP), as may be expected, is an iterative document, which is used as a measuring device of the offeror's ILS program management, as well as the contractor's contemplated compliance with specific ILS requirements.

Logistics Support Analysis (LSA)

The concept for the logistics support analysis (LSA) process was originally established in October 1973, for the Air Force, with the publication of MIL-STD-1388-1 and MIL-STD-1388-2. Logistics support analysis (LSA) is used in the DoD acquisition system to identify design and logistics elements, requirements, and resources. Currently, the LSA process, operating under MIL-STD-1388-1A and MIL-STD-1388-2A consists of two main areas. The first area of the LSA process is concerned with the application of scientific and engineering efforts to assist in determining and analyzing supportability and other integrated logistics support (ILS) objectives and requirements. The second area of LSA deals with the logistics support analysis records (LSAR) which generates and stores ILS and LSA data products (11:17). Both areas involve a continual dialogue between the designer and the logistician to identify, define, analyze, quantify, and process logistics support requirements. MIL-STD-1388-1A provides identification and explanations of a generic set of LSA tasks.

There are three main objectives of logistics support analysis (LSA) (20:23-1):

a. Supportability considerations are studied and analyzed to determine appropriate supportability design objectives. The supportability design objectives are inserted into design decisions and specification. This is normally accomplished during the concept exploration and demonstration and validation phases of the weapon system acquisition process.

b. Analyze the design to determine and document the support resources required to maintain and operate the system. This is normally accomplished during the full scale development phase.

c. Assess the adequacy of support planning and identify deficiencies and corrective actions. This is accomplished throughout the entire weapon system acquisition process.

Logistics Support Analysis Documentation (LSAD)

Logistics support analysis documentation (LSAD) encompasses all information, including computer generated data, developed as a result of the logistics support analysis (LSA) process as outlined in MIL-STD-1388-1A (tasks) and MIL-STD-1388-2A (documentation procedures). Together, these two publications form the basis for documenting all logistics support data for the system acquisition and provide a clear audit trail of actions taken and decisions made. The logistics support analysis record (LSAR) is a subset of the logistics support analysis documentation (LSAD). Much as the LSAD is used to collect all information according to tasks, the LSAR collects all information concerning detailed engineering and logistics support resources requirements.

Logistics support analysis documentation (LSAD) is designed to: 1) collect all information necessary to influence design of the system; 2) identify all logistics support resource requirements; and 3) assist in meeting all deliverable data needs. Since the majority of logistics resource decisions are made based upon the LSAD database of information, it is imperative that the LSAD be accomplished using a proven disciplined, unified, and iterative approach with periodic reviews (35:5).

Summary of Integrated Logistics Support

Integrated logistics support (ILS) is not a panacea for all the problems associated with the weapon system acquisition process, but merely one of many tools used to assist in managing logistics support through the system life cycle. The enormousness of this logistics effort demands a structured and specifically tailored technique to analyze, quantify, acquire, and integrate the totality of the logistics support requirements. This effort must be accomplished concurrently with the weapon system acquisition to ensure the supportability of the system in the field at the lowest possible life cycle cost.

IV. Support Equipment Acquisition Process

Introduction

The research project to this point has attempted to examine the support equipment acquisition process from two different, but interrelated, perspectives. The first perspective looked at was support equipment as it applied to the overall weapon system acquisition process. The second perspective looked at was support equipment as a principle element of the integrated logistics support concept. In each case, two points should be readily perceivable when dealing with the acquisition of support equipment for a major weapon system. First, only through early planning and consideration of support equipment requirements in each phase of the acquisition process is a supportable system possible. Second, only through strict adherence to the integrated logistics support plan and through proper program management is a supportable, reliable, and maintainable operational system possible.

Air Force Support Equipment Responsibilities

The acquisition of support equipment requires the coordination and cooperation of many different Air Force commands. Only through the teamwork of the different commands can the support equipment be procured in the most expedious and cost effective manner possible. The roles and responsibilities of the different Air Force commands and agencies concerned with the acquisition of support equipment are well defined and delineated. Air Force Regulation 800-12, the Acquisition of Support Equipment, identifies four primary commands which are responsible for the acquisition of support equipment: 1) Headquarters USAF; 2) Air Force Systems Command; 3) Air Force Logistics Command; and 4) Air Force using command(s) (21:5-7). See Appendix D for a listing of each command's responsibilities in the support equipment acquisition process as outlined in AFR 800-12.

Support Equipment Acquisition Management

As the weapon system being acquired begins to evolve and the design becomes more stable, the logistics support concept also develops. Included as part of the logistics support is the development of the necessary support equipment items. AFR 800-12, Acquisition of Support Equipment, estabiishes policies and principles for the acquisition of support equipment (SE), and delineates the division of management responsibility among major commands.

Support Equipment Objectives. Regardless of which command, agency, or activity is involved, the objectives of support equipment acquisition are (21:1):

> The primary objective is to obtain, at fair and reasonable prices, SE which is absolutely necessary to field-supported weapon systems. The secondary objective is to increase management awareness of the need to view SE as an integral element of weapon system acquisition and

modification programs and follow-on support. Supporting objectives that acquisition and modification program managers should pursue are:

a. Minimize the need for SE development programs.

b. Minimize the introduction of new SE, including nonstandard hand tools, into the Air Force inventory.

c. Minimize SE proliferation by advocating SE specification to design requirement rather than performance requirement.

Support Equipment Policy. The principles of integrated logistics support (ILS), as oulined in AFR 800-8 and logistics support analysis (LSA), outlined in MIL-STD-1388-1A and -2A will be applied to all support equipment acquisitions. All acquisition agencies are further required to adhere strictly to the policies of Air Force Regulation 800-12 and its supplements. The policies, as outlined in AFR 800-12 are used to "identify, configure, size (to determine optimum quantities, location, and mixes), select, develop, produce, control, and modify support equipment (SE) for Air Force programs (21:2)." To ensure that the support equipment objectives are met, AFR 800-12 requires all agencies to follow two primary policies.

First, AFR 800-12 requires that the support equipment concept, as an element of integrated logistics support, be established early in the weapon system acquisition program and be consistent with the operational and maintenance concepts established for that program. AFR 800-12 requires that support equipment (SE) considerations be a part of the system-level trade studies and system design process as early in the acquisition program as possible in order to reduce or eliminate SE requirements.

Second, AFR 800-12 requires that support equipment acquisition be bought by competitive means to the greatest extent possible, with life cycle cost (LCC) and logistics impacts being considered. AFR 800-12 further requires that support equipment (SE) acquisition be directed towards increased equipment commonality and the use of standard or preferred items of SE already in the inventory.

Support Equipment Strategy. AFR 800-12 requires that the support equipment strategy be developed prior to the engineering and manufacturing development phase of the weapon system acquisition process and be included in the program management plan (PMP) produced by the program manager (PM). All program documentation, such as program management plans and program management decisions must address the maximum practical usage of common support equipment, or at least standard or preferred items. To aid the support equipment managers in this selection, AFR 800-12 requires all implementing and supporting commands to "develop, publish, and maintain an SE Master Plan for all categories of SE (21:2)."

Support Equipment Funding. The implementing command, as designated by HQ USAF, will budget and fund for all peculiar support equipment (PSE) acquisition. The supporting command, as designated by HQ USAF, will budget and fund for all common support equipment acquisition and replacement. In the event of program management responsibility transfer (PMRT) for an item, responsibilities for budgeting and funding of its PSE will remain the responsibility of the implementing command with input from the supporting command, through the complete production phase of the total weapon system.

Support Equipment Identification. Support equipment (SE) is designed, developed, and acquired on a schedule designed to ensure its availability with the system or equipment it is required to support. Therefore, the identification of SE can not wait until the system design is firm. Support equipment identification, selection, and design must be accomplished on the basis of the logistic support analysis (LSA) performed for the system or equipment. AFR 800-12 prohibits separate engineering and technical efforts to identify SE, when those efforts are not a part of the logistics support analysis (LSA). Once the logistics support analysis has identified a need for an item of SE, a logistics support analysis record (LSAR) E-sheet or support equipment recommendation data (SERD) sheet is completed and submitted for review. Prior to submission of the LSAR E-sheets or SERD packages, the data must be reviewed by the implementing, supporting, and using commands in a pre-SERD review. See Appendix E for a listing of pre-SERD review tasks.

Support Equipment Development and Acquisition. AFR 800-12/AFSC/AFLC/Sup 1, dated 18 July 1986, makes it quite clear what is expected in the support equipment development and acquisition phase:

> For all SE, make sure design, specifications, technical orders (TO), and configuration management are sufficient to deliver SE concurrently with mission equipment as well as provide specifications and data adequate to promote breakout or competitive reacquisition. For complex SE, develop specification and TOs and conduct design reviews, configuration audits, in-process reviews of data, and tests appropriate to the complexity of the SE. For noncomplex SE, make sure adequate reacquisition specifications are obtained to acquire identical items through competition. Specifications will be carefully tailored to permit the maximum degree of design freedom while still supporting the planned mission, reacquisition, and logistics support program. [22:2]

Support Equipment Acquisition Process

Once the logistics support analysis (LSA) for the system has been performed, and the system maintenance concept developed, the support equipment acquisition process begins. The first step is to perform a repair level analysis (RLA) for each component of the weapon system. This is usually included as a part of the support equipment recommendation data (SERD) package submitted by the contractor. A repair level analysis is similar to the old optimum repair level analysis (ORLA), which was defined as

> a trade study conducted by the contractor as part of the system/equipment engineering analysis process. ORLA provides contractors and prospective contractors with a basis on which to evolve the optimum approach to repair

recommendations concurrent with the design and development process. [36:497]

The optimum repair level analysis results in recommendations on the most cost effective repair level for each component evaluated. The evaluation determines the cost of off-equipment maintenance (repairs separate from the prime system) by evaluating the alternatives of either discarding when the item fails (field), discarding at the intermediate (organizational) level, or at depot level for those items considered beyond economical repair. Once the maintenance level of each component is determined, the contractor submits a maintenance concept for each item needing repair, sometimes referred to as a repairable item or merely as a repairable. A repairable is "an item which can be reconditioned or economically repaired for reuse when it becomes unserviceable (36:581)." For each repairable, the contractor is required to provide the necessary support equipment, technical order, spare parts, and other logistics elements needed to return the asset to a mission ready state.

Once the optimum repair level analysis has been accomplished and the maintenance concept developed and approved, the contractor begins to prepare the support equipment recommendation data (SERD)s needed for the repair of the repairable component. The contractor is required to prepare a support equipment recommendation data (SERD) package on each item of support equipment required to satisfy functional requirements, with an exception of common hand tools, production tools, and items common to all Air Force bases (21:3). The common tools are included in the standard hand tool list, and becomes the authority upon which the items may be requisitioned if additional quantities of the item is required.

Support equipment identification, selection, and design must be accomplished on the basis of the weapon system it supports. The support equipment acquisition process must be concerned with providing cost effective support, on a life cycle basis, to the mission equipment. Support equipment acquisition must recognize the leadtime requirements, and the need for organic support upon delivery of the system to the user. However, special care must be taken to prevent committing to a support equipment design prior to a stable system design. This will help eliminate the need for expensive, unnecessary modification at a later date. Interim contractor support (ICS) or other alternatives must be considered, and in fact may be more cost effective than developing support equipment early in the acquisition process.

Support Equipment Plan. Upon contract award, the contractor has 60 days to submit the support equipment plan (SEP) in accordance with data item descriptions (DIDs) DI-A-3014 and DI-A-6102 to the system program office (SPO). A DID is a report, document, or drawing defined as a data requirement by a specific description in a standard format required by contract (36:195). It should be noted that all

DID numbers referenced in this research apply to F-16 contracts and may be different on other programs. Approval of the support equipment plan is required before the contractor can begin preparation of support equipment recommendation data (SERD) packages.

The support equipment plan (SEP) will systematically review and analyze the functions of the system or end item articles and establish the appropriate levels of maintenance, type of data to be prepared, manpower requirements, and type of support equipment necessary. The support equipment plan (SEP) will serve as a source of information affecting the design of the system or end item. The SEP will serve as a communication and planning medium between the system or end item designers and support equipment designers. The system program office has 30 days to approve or disapprove the SEP after submittal, and if approved the contractor may begin to develop and submit support equipment recommendation data packages to the Air Force for review.

Support Equipment Recommendation Data (SERD) Package. A support equipment recommendation data package is,

> the recommendation for SE required to support each and every CFE contract end item and GFE down through the lowest recoverable assembly, including training equipment and SE for SE. It provides sufficient engineering data for review of the function requiring support together with the recommendation for developing or acquiring an item to satisfy one or more functions. The SERD also provides availability, allowance, and logistic support information/decision regarding the SE item recommended. [26:2-3]

A support equipment recommendation data (SERD) package is prepared in accordance with DID DI-5-S-6176. The requirement for this DID must be included in the weapon system contract. DI-S-6176 is very specific in the format for each SERD submitted to the Air Force. Each SERD is identified by a five digit number (two digits, an alpha code, and two digits for a country peculiar SERD for foreign military sales programs). The first two digits specify the system component the support equipment is designed to support. The SERDs for all weapon systems in the Air Force are basically the same in format. Each SERD is made up of two parts, the Figure 1A and Figure 1B, and have a third item, which is a product of the SERD, called a support equipment requirement list (SERL) attached (see Appendix F for samples). SERDs can range in size from one page for a relatively simple item to several hundred pages for complex support equipment items

Figure 1A. The first portion of the SERD package is the Figure 1A. The Figure 1A is totally contractor prepared, and provides the initial engineering data for review by the Air Force. It consists of two sections, Part I and Part II. Part I provides the functional analysis, and gives a precise description in technical terms of the component requiring support. Part II describes the equipment required to satisfy the functional requirements in Part I, and identifies the actual manufacture and part number of the particular support equipment item. The selection of the specific equipment to satisfy the Part II requirement is the essence of the support equipment acquisition process. Often times included in the Figure 1A is a preliminary diagram or drawing of the item being recommended. The diagram or drawing is not a detailed engineering drawing, but only meant to assist the Air Force in the initial review of the item.

Figure 1B. The second portion of the SERD package is the Figure 1B. Figure 1B is prepared by the contractor with information furnished by the government. It provides the availability, logistics support, and reprocurement data for the equipment being recommended. The Figure 1B contains a great deal of other information such as, but not always, the name of the prime system being supported, the contractor's name, contract number, the national stock number and part number of the item, the lead time, and the organizational requirements, etc.

Support Equipment Requirement List (SERL). The support equipment requirement list (SERL), which is also known as the AFLC/AFSC Form 9, is probably the most important product of the support equipment recommendation data (SERD) package. The support equipment requirement list (SERL) specifies the SERD number, part number, the national stock number, and the unique revision of the SERD. The SERL also conveys the requirements the Air Force levies on the contractor for the particular SERD, such as configuration management, design, testing, review and inspection, technical and provisioning data, and other requirements. The more complex the support equipment item, the greater are the SERL requirements in terms of specifications, design reviews, and so on.

Once the Air Force has conducted the support equipment review process (to be presented later), comments are consolidated and transmitted on the support equipment requirement list (SERL) to the contractor. The SERL serves the purpose of being the final approval document of the SERD process, and is signed by a representative of the system program office engineering and logistics functions. The SERD may be either approved, conditionally approved, or disapproved through transmittal of the SERL. It is not unusual for a SERD to be revised and resubmitted a number of times before the Air Force approves it. The signed SERL is transmitted to the contractor resulting in the disposition of the SERD. Once the approved SERL is sent to the contractor, the contractor can begin the pricing and development process for the SERD. The SERL initiates a number of actions by the government, including cataloging action of the support equipment, inclusion of the support equipment in the applicable table of allowance (TA), facility planning, and a variety of other functions.

Contractor Support Equipment Selection. Selecting support equipment to satisfy the functional requirement entails a careful screening process. The screening is necessary to determine the suitability of the various sources to accomplish the required functions, and to avoid support equipment proliferation. Prior to submitting SERDs to the Air Force, the contractor is required to screen all support equipment recommendations as defined in DoD 4100.38M and DID DI-V-7016, Provisioning and Other Procurement Screening. AFR 800-12 implies that the selection of support equipment must be a result of a cost-effective trade study based on life cycle cost impact and must include analysis of support equipment sources of which there are four: 1) government furnished equipment (GFE) or equipment currently in the Government inventory; 2) commercial off-the-shelf equipment; 3) modification of either item 1 or 2; and 4) contractor furnished equipment (CFE).

The first source of support equipment is government furnished support equipment which is currently defined by government specifications with a known source of supply. The procurement of this source of equipment is the most desirable for a number of reasons. First of all, this equipment is currently stock listed in the federal supply inventory and included in the support equipment acquisition managements system (SEAMS) database. Secondly, an item manager (IM) has been assigned, which results in greater coordination and better management. Lastly, by purchasing GFE equipment, procurement costs are lowered. This is true because the non-recurring development costs, cataloging, and logistic support costs were paid when the support equipment was originally developed. An example of this type of equipment would be a universal engine stand developed by one program and can be used for a number of different programs or systems.

The second type of equipment is commercial off-the-shelf support equipment. This includes the equipment which is commercially available or for which procurement data is available. The procurement costs would be lower because the equipment is already designed and tested. However, additional costs for stock listing and cataloging, preparing technical data, etc. makes it less attractive than GFE equipment, but more attractive than other sources. An example of this type of support equipment would be a type of commercial handling equipment which was developed in the commercial world but can be used to satisfy a military requirement.

The third source of support equipment is the modification of existing government furnished equipment (GFE) or commercial off-the-shelf equipment. The benefits are identical to GFE or commercial equipment, but additional costs are also involved. Not only are stock listing, cataloging, and logistics costs included, but additional engineering effort is needed to design the interfaces between the unmodified equipment and the system hardware. An example would be a digital test stand which can be modified through the use of a weapon system peculiar interface test adapter to check out the system component.

The fourth and final source of support equipment is to develop contractor furnished equipment (CFE). This equipment is usually weapon system peculiar, and no other sources of equipment can be located to perform the functional requirement. This equipment is usually developed by the prime contractor or purchased from a subcontractor and delivered to the Air Force. Developing contractor furnished support equipment is by far the most expensive means of procuring support equipment. This is because of all the additional non-recurring costs which are included in the first unit cost. An example of this type of support equipment would be a fixture designed for repair of a particular weapon system, such as the F-16 landing gear.

Support Equipment Decision Process. Appendix G shows a simplified presentation of the contractor furnished equipment (CFE)/government furnished equipment (GFE) selection process. It depicts the decision tree the contractor uses to select support equipment, and will be used to illustrate this decision.

The Air Force directs the contractor to select common support equipment to the maximum extent possible. This is because of the reasons presented earlier, such as non-recurring development costs, an existing support structure, etc. When the contractor begins the screening process, the first decision point is to determine if a piece of common support equipment is available to satisfy the functional requirement. If so, the contractor must determine if it is a standard item. A standard item is an item which has been specifically designed or acquired to fulfill multiple Air Force requirements. If the item is a standard piece of government furnished equipment (GFE), a GFE SERD is written and submitted to the Air Force for review and approval. The funding, and procurement of standard GFE items is the responsibility of AFLC. If a standard item can not be found, the contractor must pursue a contractor furnished equipment (CFE) solution to fulfill the requirement.

However, if the item is not standard, the contractor must determine if it is a preferred item. A preferred item is one that was not specifically designed or acquired to fulfill multiple Air Force requirements but has the potential of being able to do so. At this point, a GFE SERD is written and submitted to the Air Force.

The second branch of Appendix G presents the contractor furnished equipment (CFE) selection process. If a common support equipment item is not available, a peculiar support equipment item is necessary. A peculiar item is one that is designed, developed, and acquired for only the one weapon system is was designed to support. The next decision is whether a GFE item can be found to satisfy this requirement. If not, a CFE SERD is prepared and submitted to the Air Force. Again, if a GFE item is available, a GFE SERD is written and submitted.

This has been a rather simplified depiction of the support equipment screening or selection process that the contractor conducts in submitting SERDs to the Air Force. The process involves screening the federal supply catalogs and government specifications to determine if a support equipment item is available. If not, the contractor must either develop the support equipment in house or search the industry for a support equipment developer. Often times, if the system component is being developed by a subcontractor, the prime contractor levies the requirement to develop the necessary support equipment on the vendor as part of the contract.

<u>Support Equipment Recommendation Data (SERD) Process</u>. The SERD process refers to the internal Air Force review from the point of SERD submittal by the contractor through final SERL or Form 9 approval. The acquisition of support equipment requires a systematic and orderly approach to SERD processing, to ensure that the best possible selection of support equipment is made. Appendix H presents a simplified depiction of the SERD process flow as outlined in AFR 800-12.

The SERD process begins when the contractor submits a SERD concurrently to the implementing command system program office (SPO) logistics function and the supporting command system program manager (SPM) logistics function. Only through the coordinated efforts of both AFSC and AFLC could the SERD process be possible. A discussion of each of the three primary organizations involved in the SERD process will follow.

The organization primarily responsible for the processing of SERDs is the system program office (SPO) logistics organization. In major weapon system SPOs, a division is dedicated solely to the management of support equipment. One of the system program office's major tasks is the overall responsibility for processing all SERDs (both GFE and CFE), and to conduct a detailed logistics analysis on each support equipment item. Other responsibilities are to maintain a complete SERD history file, to provide contracting with a price/intrinsic value recommendation, and to convene and chair the support equipment conferences.

The contractor will request the buying activity to hold a support equipment (SE) guidance conference 45 days after contracting of the SERDs. The conference will provide the contractor with any additional information necessary for support equipment source selection, make any recommendations from AFSC or AFLC pertaining to the selection known, and assist the contractor in any other means necessary to ensure the proper selection of support equipment. Additionally, the conference should include a table top discussion or analysis of each SERD as part of the contractor submission, and provide disposition to the contractor on each SERD item. The conference should also look at the intrinsic value of each support equipment item and consider breakout recommendations.

Attendees at the support equipment guidance conference at a minimum should include SPO representatives from logistics, technical data, and engineering groups. Other attendees should be representatives from the AFSC support equipment staff as required, AFLC cataloging and standardization branch, the system manager, the equipment allowance branch (TA monitors), HQ Aerospace Guidance and Metrology Center (calibration), and the using commands. The using command is a key player in these conferences because they are the ones which have to accomplish the mission using the recommended equipment. Any up front input by the using command will help develop better, more reliable support equipment.

The second primary organization responsible for the support equipment process is the system program office (SPO) support equipment engineering group. Their major responsibility is to be the technical focal point, and to do a detailed engineering analysis on the support equipment items. Other duties are to ensure the Part I functional analysis required support, and to determine the technical feasibility of the recommended support equipment in Part II of the SERD.

The third organization responsible for the processing of SERDs is the system program manager. The system program manager is a broad term used here to describe the supporting command (AFLC) command personnel. The system program manager includes the provisioning and cataloging activity, the engineering and reliability branch, the production management branch, and the material management directorate.

Their principle responsibility is to consolidate the AFLC position on each item of support equipment, on such things as technical feasibility, procurement matters, calibration requirements, technical data, and much more. The system program manager provides the comments on AFLC Form 603 to the system program office (SPO)(sample AFLC Form 603 provided in Appendix F), to be used in preparing the support equipment requirements list (SERL) submission to the contractor. The AFLC Form 603 contains information such as the part number, the national stock number, the recommended quantities needed, any using command comments about the SERD, and a final recommendation to the SPO about the SERD. The SPO makes the final decision concerning each support equipment item, but not without the AFLC and using command comments.

Once the comments have been received by system program office (SPO) logistics, engineering, and other SPO organizations (configuration management, contracting, and manufacturing) and the AFLC Form 603 comments have been received by the SPO, the SERL or Form 9 is prepared. The SERL may either approve, conditionally approve, or disapprove a SERD. The SERL is signed by a representative of SPO logistics and engineering functions, and sent to the program manager for review. The program manager once again examines the potential for alternative acquisition methods. The final SERL is transmitted to the contractor to: begin support equipment development if the SERL is approved, make recommended modification and resubmit if the SERL is conditionally approved, or discontinue support equipment development if the SERL is disapproved. If the SERL approves the item of support equipment, the SERD then begins the pricing cycle and development process by the contractor. On the Air Force side, the signed, approved SERL begins the cataloging and planning functions as deemed necessary. In the event the SERD is designated as GFE, the government must begin actions to procure the item. This marks the end of the SERD process.

V. Research Methodology

Introduction

The reader has been presented in the previous four chapters, with a description of the environment and the process of support equipment acquisition from three different perspectives; with the author's observations on the importance of these topics; and, with justification for research into this area. This chapter focuses on the details of the research conducted to answer the three research questions as presented in Chapter I. The chapter begins with a brief explanation of the research strategy employed and then describes the instruments used for data collection. The chapter then shifts to coverage of the procedures used to analyze the data gathered in the data collection process.

Research Strategy

To accomplish the objectives of this study, a research strategy was developed to collect a representative sampling of the opinions, judgments, and perceptions of personnel involved full time with the acquisition of support equipment for the F-16 weapon system. These personnel were employed at three different locations: 1) AFSC/F-16 SPO, Wright-Patterson AFB, OH (implementing command); 2) AFLC/F-16

Directorate, Hill AFB, UT (supporting command); and 3) General Dynamics Corporation, Fort Worth, TX (prime contractor).

A nonrandom (nonprobabilistic) sample selection plan was used for three reasons. First, the people to be interviewed were located at three different geographical areas. Second, people experienced in the acquisition of support equipment were in the best position to provide the information needed. According to Emory, the requirement for expert judgement or opinion often necessitates the use of nonrandom sample selection (29:279). The third reason for the use of nonrandom sample selection was the fact that the entire population could not be identified, thus eliminating the possibility of most types of random sampling error.

The design of the research was founded on literature reviews of related research, and specific assessments of opinions proffered by current practitioners of logistics and acquisition management. From the reviews and the opinions, a list of 120 potential questions was constructed. This list was again reviewed by the author and two senior acquisition management personnel to compile the list of 26 general questions, excluding demographic questions, that was subsequently used in the initial interviews and an additional 8 questions that were used in specific, expert follow-on interviews. Appendix I provides a sample of the general interview questionnaire. Appendix J provides a sample of the questionnaire used in the expert follow-on interviews. The data were grouped by command (AFSC or AFLC) and contractor. Statistical analysis was used to test for any significant differences between the three organizations in how the logistician/acquisition manager perceived the accuracy of the statements presented in the initial interview. Data from certain portions of the expert follow-on interviews were analyzed using the Delphi technique (discussed later) and used to establish possible corrections or modifications to the acquisition process. The development of the data collection plan, measurement instruments, and the data analysis plan are discussed in detail in the remainder of this chapter.

Data Collection Plan

Collecting data of this type requires either a personal interview, telephone interview, or mailed survey approach. In evaluating these three approaches several factors were considered. The mailed survey approach was rejected due to the limited size of the population and the importance of attaining a high response rate. Mail surveys have been shown to have a strong bias of nonresponse especially when the respondents have no allegiance to the sponsoring organization. In addition, mail surveys would not have been suitable for attaining large amounts of information or probing deeply into questions as this research effort required in the expert follow-on area. Likewise, respondents tend to refuse to cooperate when the mail questionnaire is long and complex as this research would have required (29:171-176).

A combination of personal and telephone interviews was selected as most appropriate for this research project. Personal interviews would be held for those persons assigned at Wright-Patterson AFB and telephone interviews would be held for those persons assigned to either General Dynamics Corporation or Hill AFB. Personal and telephone interviews allow three additional advantages not present in the mail survey:

1. It would encourage greater depth and detail of information since the subject was more likely to concentrate and devote time to the question.

2. The volume and quality of their proposed solutions would increase since it is easier for respondents to vocalize opinions than to write them. Similarly, the personal and telephone interview would allow expansion on proposed solutions, and through the interaction, the researcher could gain a more complete understanding of the subject's comments.

3. There would be an improved quality of responses by enabling the interviewer to monitor the conditions of the interview, prescreen respondents, and to adjust the language of questions by providing on-the-spot explanation in order to limit missing and invalid data or incorrect assumptions on the respondents part (29:160-171).

A structured interview was selected and designed to be self-explanatory so that it could stand alone or with very little explanation. The structured approach was also selected for the following reasons:

1. Increased uniformity between interviews through standardized wording.

2. Minimized diversity of interpretation of the questions.

3. By maintaining a similar instrument for all three organizations an increased reliability when comparing results was gained.

Measurement Instruments

The objective of this research was to: identify the logistical problem areas associated with the acquisition of support equipment; means of alleviating or lessening these problems; and to identify any additional problem areas peculiar to foreign military sales (FMS) programs. A four phase research plan was developed to accomplish this objective. The four phases included the gathering of perceived opinions on the current acquisition process, identifying of major problems in the acquisition process, identifying of possible solutions to these problems, and the identifying of peculiar FMS problems.

Phase one of the research plan used interview instrument one (Appendix I) to obtain demographic information on the person being interviewed, as well as his or her opinions of the current acquisition process based upon scaled rankings of 26 interview statements. Phase two and three of the research plan used interview instrument two (Appendix J) to solicit expert opinion on support equipment acquisition problems and possible solutions. Phase four of the research plan used both interview instruments one and two to establish peculiar problems in foreign military sales programs.

Instrument One (General Interview). Instrument one was divided into two parts. Part one, consisting of questions one through ten, was designed to solicit demographic information. Questions one through seven collected information on such things as job title, rank or grade, experience, and training. Question eight was concerned with how the person being interviewed perceived the adequacy of the organization he or she was assigned to in regards to funding, manning, training, and delegated responsibility. Question nine attempted to distinguish perceived management skills, and question ten solicited information regarding current work experience in foreign military sales (FMS). Demographic information was gathered to assist in the selection of those people having sufficient experience in logistics/acquisition to be considered "experts" and thus eligible for interview instrument two. For this research, an expert was an individual who had over six years of experience in either the acquisition or logistics field, currently was involved full time in support equipment acquisition, and whose job involved foreign military sales at least 50 percent of the time. The assumption was made that an incumbent of a logistic/acquisition position in a major program for over six years was relatively knowledgeable. Appendix K provides a sample of the job description for a program manager for logistics. Appendix L provides a job description for a support equipment program manager for acquisition. No attempt was made to differentiate based on personal factors. Part two, question eleven, was subdivided into 26 general statements concerning the current acquisition process. The person being interviewed was asked to express his/her opinion on the correctness of the statement by ranking how strongly they agreed or disagreed on a five-point Likert scale. The data analysis plan for instrument one is discussed later in this chapter.

<u>Instrument Two (Expert Follow-on Interview)</u>. Instrument two consists of eight questions designed to extract opinions, from experts in the logistics/acquisition field, concerning support equipment acquisition problems and possible solutions. Question 12 and 13 are follow-on questions to instrument one that the researcher believed would be best answered by experts. Questions 15 through 19 deal directly with the research questions, as outlined in Chapter I, and as such are the primary area of concern.

The Delphi method was used to obtain expert opinion. The Delphi method, developed by the Rand Corporation, is a method of forecasting probable future events and trends, as well as solving theoretical problems. The name was taken from the oracle of Delphi in the Greek city-state of the same name. From the seventh century B.C. until the first century A.D., the oracle of Delphi was consulted by many to forecast what the future would bring. The Delphi methodology or technique is discussed in greater detail later in this chapter.

This research used the Delphi method for two reasons. First, the experts could not all be located at a single location. Therefore, a meeting with all selected experts was not possible because of individual commitments and funding constraints. Second, the questions to be asked in the expert interview were theoretical in nature or highly opinionated. Based on these constraints, the Delphi method was selected as the most appropriate method for data collection.

The use of face-to-face group discussion was considered as an alternative to the Delphi method. Group discussion techniques have the following disadvantages which the Delphi technique avoids:

- inclination towards hasty formulation of preconceived notions;

- tendency to defend a stand once publicly taken;

- effect of persuasively stated opinion of others;

- effect of opinion of greatest supposed authority (especially in military);

- effect of loudest, longest, or best formatted presentation;

- effect of redundant and irrelevant information;

- band wagon effect of majority opinion.

Because of these problems, location of people to be interviewed, and funding constraints, the anonymity of the Delphi method was considered superior for extracting information on support equipment acquisition problems.

Data Analysis Plan

Two basic forms of data analysis was used for this research project. General statistical analysis techniques were employed for analyzing the responses to interview instrument one and questions 12, 13, and 15 of instrument two. Questions 14, 16, 17, and 18 of interview instrument two were analyzed using the Delphi method of expert analysis. Each of these two forms of analysis are discussed in more detail below.

General Statistical Analysis. For the purpose of this research, the data will be organized into four groups: 1) responses from AFSC; 2) responses from AFLC; 3) responses from General Dynamics Corporation; and 4) all responses combined. Two forms of statistical analysis will be used for each question designed to obtain quantitative data. First, the data will be subjected to analysis for computation of mean, standard deviation, standard error of the mean, lower and upper 95 percent confidence intervals, coefficient of variation, median, minimum and maximum, and in some cases, the frequency distribution. Second, the data from each question will be analyzed using the Kruskal-Wallis Oneway Nonparametric Analysis of Variance (AOV), as described below, to determine if any significant variations in responses between the four groups occurred.

The Kruskal-Wallis Oneway Nonparametric AOV (37:965-969) technique was selected because of the relatively small sample size of persons interviewed. Due to the number of available logistics/acquisition persons assigned to each organization, no attempt was made by the researcher at random sampling. Therefore, the data collected would be considered nonparametric versus parametric where data is collected using independent random sampling techniques. The Kruskal-Wallis technique requires no assumptions concerning the population probability distributions to compare the p populations, but does require a minimum of five samples in each area of concern. The Kruskal-Wallis statistic (H-statistic) measures the extent to which the s samples differ with respect to their relative ranks. The H-statistic becomes increasingly large as the distance between the sample means ranks grows.

The four groups of data collected, were analyzed by the Kruskal-Wallis technique to determine the acceptance or rejection of the hypothesis that "the p probability distributions are identical" versus the alternate hypothesis that " at least two of the p probability distributions differ in location". The null hypothesis will be rejected for this research based upon three degrees of freedom (p-1) and an alpha level of 0.050. This equates to an upper tail rejection region of H-statistic > 7.81473.

The analytical software package used, Statistix version 3.1, also provides an observed significance level, or p-value, for each question based upon the Kruskal-Wallis technique. This p-value is the probability (assuming the null hypothesis is valid or true) of observing a value of the test statistic that is at least as contradictory to the null hypothesis, and as supportive of the alternative hypothesis, as the one computed from the sample data. The statistical analysis package also computes a parametric analysis of variance, F-statistic, and p-value, but informs the user that these test results are frequently anticonservative.

A summation of all data analysis results for both the descriptive statistics and Kruskal-Wallis technique are provided in Appendix N. Chapter VI will provide a condensed version of the data for each question to assist the reader in interpretation.

Delphi Method or Technique. Since it is infeasible to use mathematical models to solve theoretical problems or questions, the Rand Corporation developed a method of soliciting expert opinion to answer questions of a theoretical nature. This Delphi method, also referred to as opinion methodology, uses an iterative procedure to obtain a consensus from experts. Iterative feedback aids in developing a final consensus from the experts by allowing an opportunity to rethink a question after having seen the responses of others. The Delphi method is not just a technique for generating opinions about a subject area. Respondents are asked to give reasons for their expressed opinion and these reasons may be subjected to a critique by fellow respondents. As the opinions and critiques are reviewed and refined by all respondents, a consensus emerges. It is not uncommon for several iterations of the think-critique-rethink-critique process to occur. In an article concerning the application of the Delphi method, Shankar Basu states,

> The number of rounds is an important consideration because it affects the quality of the forecast as well as the effort expended. Dalkey has shown that the convergence of the forecast improves with each round, but reaches a saturation level in about three to five rounds. [4:27]

Two to three iterative processes are normal for a consensus, with a greater number possible for multi-faceted problems and possibly only one iteration for simple or common problems. It was expected that two iterations would be required to reach a general consensus in this research area.

A consensus was to be achieved when more than seventy percent of the respondents agreed on a topic area. This seventy percent was based on the theory that eight experts would be interviewed under the expert follow-on interview questionnaire format. The Delphi questions, questions 14, 16, 17, and 18 of interview instrument two, were compiled in such as way as to avoid leading questions. The spontaneity of expert opinion was expected to come from the open questions.

When selecting the panel of experts to be interviewed, Basu recommends three considerations be followed (4:25-26). First, careful consideration should be given to the number of experts selected, since too low a number may result in a high average group error while too high a number may cause too great a workload. Second, consideration should be given to the expertise of each panel member, including such areas as : 1) years of professional experience; 2) educational background; 3) access to relevant information; and 4) responsibility and authority. Thirdly, Basu recommends careful consideration be given to the environment of the panel in that,

> The ideal panel environment is one where there is no direct confrontation, and the channel of communication is through data input and opinion feedback in successive rounds. Anonymous response is of prime importance to avoid bias, unwarranted pressure, and the "band wagon" effect so commonly observed in open group meetings. [4:26]

Experts are used in the Delphi method because of their extensive knowledge and experience concerning particular areas of a subject and their intuitive insight into the subject matter. Again, for this research, expert was defined as an individual who had over six years of experience in either the acquisition or logistics field, currently was involved full time in support equipment acquisition, and whose job involved foreign military sales at least 50 percent of the time.

Preinterview and Interview

After preparing interview instruments one and two, the next step was to test the instruments. Two logistics management specialists from the F-16 system program office, known to meet the established expert criteria, were chosen for the test run. Based on the comments received from the test run, changes were made to improve the interview instruments. In each case, no modification was made to the questions themselves, but a more detailed introduction and explanation was established.

In order to improve subject receptiveness, each interview was preceded by brief introductions, explanations of the objectives of the study, the beneficial values of the findings, and a reassurance of the confidentiality of the interview. The subject first completed the demographic portion of interview instrument one, and then received instruction on the completion of question 11, and its associated 26 parts, using the Likart five-point scale. Though designed to stand alone, if the subject had any interpretation questions they were answered. However, interaction at this point was purposely limited in order to reduce any bias on the rating results.

After finishing instrument one, the subject was asked to identify any other significant constraints or problems in the logistics/acquisition area not covered in the interview. The researcher recorded their comments (usually paraphrased) and has included them in Appendix M.

The findings and analysis of interview instruments one and two are presented in Chapter VI (a sample listing of data provided by Statistix software analysis is provided in Appendix N). Chapter VII presents the problem areas and possible solutions as identified using the Delphi technique in interview instrument two, and Chapter VIII will attempt to form conclusions and recommendations based on this research.

VI. Findings and Analysis

Overview

The objective of the data research plan was four fold: 1) the gathering of perceived opinions on the current support equipment acquisition process; 2) identification of major problems in the support equipment acquisition process; 3) identification of possible solutions or alternatives to these problems; and 4) identification and alternative formulation for problems peculiar to foreign military sales (FMS) programs.

The research was accomplished as outlined in Chapter V. Interview instrument one, Appendix I, solicited demographic and perceived opinions from 33 persons. Of the 33 persons interviewed, 15 were from Air Force Systems Command, ten were from Air Force Logistics Command, and eight were from General Dynamics Corporation, Fort Worth, Texas. Interview instrument two, Appendix J, solicited expert opinion from eight persons who met the criteria established in Chapter V to qualify as experts (six years experience in either acquisition or logistics, currently involved full time in support equipment acquisition, and whose job involved foreign military sales at least 50 percent of the time. Of the eight experts interviewed, four were from Air Force Systems Command, two were from Air Force Logistics Command,

and two were from General Dynamics Corporation, Fort Worth, Texas.

As discussed in Chapter V, no demographic analysis or data will be released due to the promise of confidentiality. Question 11 of instrument one and questions 12, 13, and 15 of instrument two are presented below with their associated general statistical analysis. Questions 14, 16, 17, and 18 of interview instrument two are presented below, along with pertinent data concerning the Delphi method used in soliciting their responses. Responses to question 19 of interview instrument two are listed in Appendix M.

Five-Point Likart Scale.

Several guidelines were followed in developing the graphic or Likart scale:

- the rating line was long enough to allow discrimination among the five factors, but not long enough to disrupt the rater's unity of continuum;

- only five factors or selections were allowed, thereby both decreasing the amount of confusion on the rater's part and ensuring adequate responses were received in each area for statistical analysis;

- the line was continuous depicting the continuity of expressed opinion;

- the strongest opinions were placed at the extremes of the line and the least opinion in the center (this could have affected the results to some extent due to the error of central tendency);

On a scale of 1 to 5, please express your opinion on the following statements:

1	2	3	4	5
Strongly Disagree		Neither Agree or Disagree		Strongly Agree

Question 11

Each section of question eleven will be discussed in three parts. The first part will describe any assumptions or expectations made by the researcher that influenced the design of the question. The second part will provide a synopsis of the data analysis provided in Appendix N. Part three will provide an analysis or interpretation of the data collected as perceived by the researcher and two experts in the field of logistics/acquisition.

Question 11 Part A.

"AFSC is concerned with cost, schedule, and performance of the weapon system and could care very little about support. Support is AFLCs problem."

Assumptions / Expectations. AFSC is considered the implementing command and AFLC the supporting command during the acquisition process. As such, it has often been thought that AFSC program management is more concerned with the cost, schedule and performance of the weapon system than with the eventual support of the fielded system. AFLC has frequently expressed their concern that support issues are often neglected until after the fielding of the system. It was expected that AFSC would disagree with this statement, AFLC would highly agree, and GD/FW would be neutral.

Findings. The overall mean score was 3.061, with a mean of 2.600 for AFSC, 3.800 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 5.9630 with a 0.1134 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, AFSC tended to disagree with the above statement and AFLC tended to agree, but not to as large a degree as expected. As expected GD/FW was neutral. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part B.

"Problems encountered in our Foreign Military Sales (FMS) programs are symptomatic of USAF problems."

Assumptions / Expectations. Although there are undoubtedly peculiar problems associated with FMS programs, it was believe that all three organizations would agree that most problems were encountered both in USAF and FMS acquisition programs.

Findings. The overall mean score was 4.000, with a mean of 4.000 for AFSC, 3.800 for AFLC, and 4.250 for GD/FW. The Kruskal-Wallis H-statistic was 1.0725 with a 0.7837 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations agreed that FMS programs suffered the same acquisition problems as USAF programs. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part C.

"The USAF takes contractor recommendations as gospel with little follow-up evaluation of their own."

Assumptions / Expectations. Because of the experience level of logisticians and engineers in the SPOs, it is often thought that perhaps too much reliance is placed on contractor evaluations and recommendations. It was believed that AFSC and AFLC would agree with this statement and that GD/FW would disagree.

Findings. The overall mean score was 3.000, with a mean of 3.000 for AFSC, 3.000 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 0.2289 with a 0.9728 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. All three organizations were identical in their mean ratings of neither agree or disagree. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part D.

"Support equipment (SE) is often considered as a follow-on buy and as such does NOT receive the management attention it should according to the Integrated Logistics Support (ILS) plan."

Assumptions / Expectations. Much as in question 11 part A, it was expected that AFSC would disagree with this statement, AFLC would highly agree, and GD/FW would be neutral. Again, this question considered the fact that AFSC, as the implementing command, was more concerned with cost, schedule, and performance of the weapon system than with the eventual need for support.

Findings. The overall mean score was 3.788, with a mean of 3.867 for AFSC, 4.100 for AFLC, and 3.250 for GD/FW. The Kruskal-Wallis H-statistic was 7.3163 with a 0.0625 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Although all three organizations agreed to some extent that support equipment was looked upon as follow-on support, as expected, AFSC had a lower agreement mean than AFLC and GD/FW was only slightly above the neutral point. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part E.
"Up-front definitization of ALL FMS programs should be mandatory and only those items definitized should be considered Late-to-Need at aircraft delivery time."

Assumptions / Expectations. It was expected that all three organizations would agree with this statement. In the majority of FMS programs there are numerous items of support equipment that are considered late-to-need when in fact they were not placed on order until well into the program acquisition phase. Often this is caused by the FMS country either not definitizing the program upfront or not accepting the table of allowances recommendation levels. Occasionally, additional units are added to the support program after reconsideration or as support for other programs already established. When all items are considered late-to-need after the established RAD, any items ordered after the initial procurement cycle tend to be late.

Findings. The overall mean score was 3.242, with a mean of 3.000 for AFSC, 3.800 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 5.9703 with a 0.1131 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. All organizations agreed wholeheartedly that up front definitization was necessary, but they were hesitant to say that the order date should be considered when determining which items were going to be late-to-need. Possibly this question should have been rewritten as two separate questions. It is believed by the researcher that this question was not totally understood by the people being interviewed and as such the mean results were centralized. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part F.

"Breakdown in communications often allow simple problems to go unnoticed until they become large problems and the lack of program management /planning can keep these large problems from being recognized. This is a fairly frequent occurrence in the F-16 community."

Assumptions / Expectations. It was expected that all three organizations would agree with the above statement. It was also expected that GD/FW would have the lowest level of agreement, because of the lesser degree of micromanagement used in their organization. A definite higher level of micromanagement and lack of communications is believed to exist in the SPOs (especially between the SPOs), than exists at GD/FW or most contractor facilities.

Findings. The overall mean score was 4.121, with a mean of 4.067 for AFSC, 4.500 for AFLC, and 3.750 for GD/FW. The Kruskal-Wallis H-statistic was 4.6526 with a 0.1991 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations agreed that breakdowns in communications were a definite problem. What was unexpected was the high level of agreement that GD/FW displayed. After interviewing the GD/FW experts in the Delphi phase, it is believed that GD/FW personnel has such a high level of agreement due to their belief that a lack of communications was a problem for AFSC and AFLC, but not to a large degree in their organization. That is not to say that GD/FW does not have a communication problem, but just not to the degree that AFSC and AFLC does. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part G.

"Contractors are concerned with system first, then support."

Assumptions / Expectations. It was expected that AFSC and AFLC responses would agree with this statement and GD/FW would disagree. This statement is a spin-off of question 11 part A and D, but looks at the contractors versus AFSC. The assumption here was that the contractor is more concerned with the weapon system than support because of money. The high dollar value of a weapon systems is of prime importance to a contractor and once fielded, it must be supported.

Findings. The overall mean score was 3.636, with a mean of 4.067 for AFSC, 4.300 for AFLC, and 2.000 for GD/FW. The Kruskal-Wallis H-statistic was 18.3962 with a 0.0004 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and AFLC agreed that contractors are more concerned with the weapon system than with support equipment. Also, as expected, GD/FW totally disagreed with this statement. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part H.

"A lack of current regulations and ambiguous regulations frequently causes problems in the acquisition process."

Assumptions / Expectations. It was believed that AFSC and AFLC would agree with the above statement and that GD/FW would disagree to some extent. AFSC and AFLC are often hampered by conflicting regulations, but GD/FW can use these conflicts to their advantage. It was also believed that GD/FW personnel were also more familiar with the regulations than Air Force personnel and therefore in a better situation to use the regulations than merely have to abide by them.

Findings. The overall mean score was 3.939, with a mean of 3.600 for AFSC, 4.000 for AFLC, and 4.500 for GD/FW. The Kruskal-Wallis H-statistic was 5.0809 with a 0.1660 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Although AFSC and AFLC both agreed that a lack of regulations and ambiguous regulations frequently caused problems, unexpectedly, GD/FW agreed to a higher degree. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part I.

"All regulations should be strictly adhered to regardless of their effect on the acquisition program."

Assumptions / Expectations. It was believed that AFSC and AFLC would disagree with the above statement and that GD/FW would agree to some extent. The same basic considerations given in part H above, apply for this statement.

Findings. The overall mean score was 2.182, with a mean of 2.067 for AFSC, 1.600 for AFLC, and 3.125 for GD/FW. The Kruskal-Wallis H-statistic was 12.5565 with a 0.0057 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and AFLC disagreed with this statement and GD/FW agreed. It believed that the reason for GD/FW showing a preference to abiding to regulations is that they are more familiar with the regulations and can thus use them to their benefit. This use of regulations for the companies benefit is especially evident for those areas of ambiguous regulations where the company can pick the regulation that they wish to abide by. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part J.

"Milestones are only as good as the information used to formulate them. Frequently milestone dates are briefed that are known to be erroneous, but it is hoped that the problem can be corrected and that the dates may once again be true."

Assumptions / Expectations. It was expected that both AFSC and AFLC would agree with this statement, but because of contractual constraints and company policies GD/FW would tend to neither agree or disagree.

Findings. The overall mean score was 3.939, with a mean of 4.000 for AFSC, 4.400 for AFLC, and 3.250 for GD/FW. The Kruskal-Wallis H-statistic was 9.3929 with a 0.0245 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and AFLC both agreed that erroneous milestones are briefed and subsequently cause program management problems. Also, as expected, GD/FW neither agreed or disagreed. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part K.

"There is a disproportionate amount of problems in our FMS programs compared to Air Force programs."

Assumptions / Expectations. As a follow-on to question 11 part B, it was expected that all three organization would tend to disagree with this statement. It was believed that all organizations would contend that problems in FMS usually follow similar problems with USAF programs.

Findings. The overall mean score was 2.485, with a mean of 2.800 for AFSC, 2.300 for AFLC, and 2.125 for GD/FW. The Kruskal-Wallis H-statistic was 6.4234 with a 0.0927 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations agreed that FMS problems are not disproportionate to USAF problems. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part L.

"In FMS programs, many SE items are considered 'critical' by the countries, when in fact they are merely nice to have. This causes undue management problems."

Assumptions / Expectations. Many times FMS countries are found to be ordering items that they consider to be critical, but have never yet been built or used by the USAF, even though the F-16 has been in the field for years. There are several reasons for this, but two are especially evident. First, the FMS countries do not have the advantages of highly trained personnel, access to similar support equipment, or ability to use other items for workarounds. Second, and often the most prevalent when ordering common support equipment, the country is ordering an item that they need on a different program whose money line may have run out. As such, it was expected that all three organizations would agree that not all critical items ordered by the FMS countries are truly critical.

Findings. The overall mean score was 3.697, with a mean of 3.733 for AFSC, 3.900 for AFLC, and 3.375 for GD/FW. The Kruskal-Wallis H-statistic was 1.7025 with a 0.6364 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations agreed that the countries often ordered items they deemed critical and which in fact are not considered critical by the USAF. Also, as expected, AFLC agreed with the highest mean (AFLC is in charge of procuring common support equipment). There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part M.

"In FMS programs, many SE items are considered 'critical' by the country, but not by the Air Force. Justification of critical items should be required prior to preferential treatment of orders."

Assumptions / Expectations. As a follow-on to the statement above, it was believed that all organizations would agree that justification of the criticality of an items should be required prior to preferential treatment of orders.

Findings. The overall mean score was 3.667, with a mean of 3.933 for AFSC, 4.200 for AFLC, and 2.500 for GD/FW. The Kruskal-Wallis H-statistic was 13.9695 with a 0.0029 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and AFLC both agreed that justification of an item as "critical" should be required prior to preferential treatment. GD/FW disagreed with this statement. Upon reflection, it is easy to understand that GD/FW welcomes "critical" items regardless of their criticality. Critical items cost more. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part N.

"When considering SE items as Late-to-Need, less inference should be placed on the RAD date and more inference should be placed on the date the order was received."

Assumptions / Expectations. As a follow-on to question 11 parts E, L, and M, it was expected that all three organizations would agree with this statement. If an item is ordered one year before RAD and it has a two year procurement leadtime, it was believed that the item should not be considered late-to-need.

Findings. The overall mean score was 2.606, with a mean of 2.733 for AFSC, 2.500 for AFLC, and 2.500 for GD/FW. The Kruskal-Wallis H-statistic was 0.5348 with a

0.9112 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Unexpectedly, all three organizations agreed that regardless of when ordered any item late to RAD should be considered late-to-need and managed as such. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part O.

"In FMS programs, the 'definitization' process could be greatly enhanced by utilizing one person from AFSC and one person from AFLC for SE definitization for all new or follow-on programs."

Assumptions / Expectations. It was expected that AFSC and AFLC would disagree with this statement and GD/FW would agree. The current programs are operated such that the support equipment managers assigned to a country by AFSC and AFLC are the people that definitize the program. These may in fact be new, untrained persons just hired for the program startup. GD/FW uses the same highly trained, experienced personnel for all definitizations and assigns support equipment managers to work the program after definitization.

Findings. The overall mean score was 3.303, with a mean of 2.867 for AFSC, 2.900 for AFLC, and 4.625 for GD/FW. The Kruskal-Wallis H-statistic was 22.5659 with a 0.0000 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and AFLC disagreed with the statement and GD/FW highly agreed. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

<u>Question 11 Part P</u>.

"The majority of the people in your organization are problem oriented ... have problem, work it; no problem, wait."

What about in:	1) AFSC	3) AFLC
	2) FMS	4) Contractor

<u>Assumptions / Expectations</u>. It was believed that each organization would disagree with the statement concerning their organization being problem oriented or using the management by exception concept and tend to believe that all organizations as a whole are managed by exception.

<u>Organization Respondent Belong To</u>.

<u>Findings</u>. The overall mean score was 3.000, with a mean of 3.933 for AFSC, 2.200 for AFLC, and 2.250 for GD/FW. The Kruskal-Wallis H-statistic was 21.6164 with a 0.0001 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

<u>Analysis</u>. People in AFSC agreed that they managed by exception, while persons working in AFLC and GD/FW claimed that their organization did not. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Air Force Systems Command.

Findings. The overall mean score was 3.909, with a mean of 3.733 for AFSC, 4.400 for AFLC, and 3.625 for GD/FW. The Kruskal-Wallis H-statistic was 6.5929 with a 0.0861 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Overall, all three organizations believed that AFSC used a management by exception concept. There were no significant differences between the levels of agreement for the three organizations.

Foreign Military Sales Representatives.

Findings. The overall mean score was 3.879, with a mean of 3.933 for AFSC, 4.000 for AFLC, and 3.625 for GD/FW. The Kruskal-Wallis H-statistic was 0.6442 with a 0.8863 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Overall, all three organizations agreed that FMS country representatives used a management by exception concept. There were no significant differences between the levels of agreement for the three organizations.

Air Force Logistics Command.

Findings. The overall mean score was 4.182, with a mean of 3.733 for AFSC, 4.600 for AFLC, and 4.500 for GD/FW. The Kruskal-Wallis H-statistic was 12.0380 with a 0.0073 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Overall, all three organizations agreed that AFLC used a management by exception concept. However, of the three, persons from AFSC were less sure of this. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

General Dynamics Corporation, Fort Worth, TX.

Findings. The overall mean score was 2.909, with a mean of 2.800 for AFSC, 3.000 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 0.6896 with a 0.8757 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Unexpectedly, all three organizations believed that GD/FW did not use the management by exception concept or were unsure. It is interesting to note that GD/FW was the only organization believed not to use this technique. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part Q.

"SE design must be concurrent with system design to ensure supportability of the weapon system. All efforts required to fulfill this concept are met by our organization."

Assumptions / Expectations. It was believed that although all three organizations would agree that SE design must be concurrent with weapon systems design it would be unlikely that any organizations would believe that they are doing everything possible to ensure this.

Findings. The overall mean score was 3.576, with a mean of 3.267 for AFSC, 3.800 for AFLC, and 3.875 for GD/FW. The Kruskal-Wallis H-statistic was 2.7664 with a 0.4291 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organization failed to say that they were doing everything possible to ensure concurrent design. It should be noted that the organization that had the lowest mean, AFSC, should be the one striving hardest to ensure concurrent design. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part R.

"There is a definite lack of 'openness' in communications between the various organizations ... organization may not say they have a problem unless specifically asked, and asked in a specific way."

Assumptions / Expectations. As a follow-on to question 11 part F, it was expected that all three organizations would agree that their exists a definite lack of 'openness' in communications.

Findings. The overall mean score was 3.848, with a mean of 4.067 for AFSC, 3.900 for AFLC, and 3.375 for GD/FW. The Kruskal-Wallis H-statistic was 5.5664 with a 0.1347 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. Again, as in part F, all three organizations agreed that there is a lack of communications, but GD/FW appeared to be the least affected. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part S.

"Frequently decisions are made by one organization or group without regarding the impact of that decision on other organizations or groups."

Assumptions / Expectations. As a follow-on to part F and R, this statement was expected to show that not only did all three organizations agree that there are communications problems, but that these gaps in communications frequently affect the ILS program.

Findings. The overall mean score was 4.121, with a mean of 4.267 for AFSC, 4.800 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 15.4364 with a 0.0015 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Again, as in part F and R, AFSC and AFLC agreed with the statement, and GD/FW should a tendency to be least affected. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part T.

"All possible efforts are made to ensure the use of common SE instead of designing new SE to meet current needs."

Assumptions / Expectations. It was expected that all three organizations would agree to a point that they strived to ensure the use of common support equipment, but would not be able to say that everything possible was done.

Findings. The overall mean score was 3.394, with a mean of 2.800 for AFSC, 3.500 for AFLC, and 4.375 for GD/FW. The Kruskal-Wallis H-statistic was 13.5291 with a 0.0036 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Unexpectedly, AFSC failed to even maintain a 3.0000, neither agree or disagree, mean. AFLC and GD/FW both agreed that they tried to ensure common support equipment usage, with GD/FW being more adamant than AFLC. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part U.

"Specifications for SE are often developed by contractors to ensure that common SE is inadequate to meet the request, thus requiring new or peculiar SE procurement."

Assumptions / Expectations. It was expected that all three organizations would disagree with this statement, with GD/FW being the most adamant.

Findings. The overall mean score was 2.939, with a mean of 3.200 for AFSC, 3.800 for AFLC, and 1.375 for GD/FW. The Kruskal-Wallis H-statistic was 20.6364 with a 0.0001 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Unexpectedly, AFLC believed that the contractor did in fact establish specifications to ensure common SE was inadequate to meet requirements. As expected, GD/FW denied this statement. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part V.

"Often requests for new or peculiar SE are approved because using commands want new equipment for new systems."

Assumptions / Expectations. Although this type of statement is frequently heard in meetings and reviews, it was expected that all three organizations would disagree.

Findings. The overall mean score was 2.909, with a mean of 3.200 for AFSC, 2.800 for AFLC, and 2.500 for GD/FW. The Kruskal-Wallis H-statistic was 4.3766 with a 0.2236 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations disagreed, with GD/FW being the most adamant. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part W.

"More effort should be placed on contractually obligating the contractor to deliver on time. Slippages are fairly common and due to need we are forced to accept the slippage."

Assumptions / Expectations. It was expected that both AFSC and AFLC would agree enthusiastically with this statement and GD/FW would be just as disagreeable.

Findings. The overall mean score was 4.061, with a mean of 4.333 for AFSC, 4.500 for AFLC, and 3.000 for GD/FW. The Kruskal-Wallis H-statistic was 11.8905 with a

0.0078 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Although AFSC and AFLC tended to wholeheartedly agree, the mean for GD/FW showed a neither agree or disagree trend. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part X.

"Size, frequency, and difficulties in processing CCPs and ECPs have become more and more of a problem and frequently cause late delivery of SE."

Assumptions / Expectations. It was expected that both AFSC and AFLC would agree enthusiastically with this statement and GD/FW would be just as disagreeable.

Findings. The overall mean score was 4.364, with a mean of 4.600 for AFSC, 4.600 for AFLC, and 3.625 for GD/FW. The Kruskal-Wallis H-statistic was 12.4132 with a 0.0061 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. Although AFSC and AFLC tended to wholeheartedly agree, the mean for GD/FW showed a slight tend to also agree. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Question 11 Part Y.

"An interactive database management system for SE tracking, ordering, processing, delivery etc., accessible by AFSC, AFLC, ILC, and contractors and greatly enhance my job performance."

Assumptions / Expectations. The assumption or expectation here was that all three organizations would highly agree that an interactive database would greatly enhance the program.

Findings. The overall mean score was 4.303, with a mean of 4.200 for AFSC, 4.600 for AFLC, and 4.125 for GD/FW. The Kruskal-Wallis H-statistic was 3.1373 with a 0.3709 associated p-value. The hypothesis that the p-probability distributions are identical was accepted.

Analysis. As expected, all three organizations agreed with the statement, but not to the high degree expected. There were no significant differences between the levels of agreement for the three organizations.

Question 11 Part Z.

"Program Management Responsibility Transfer (PMRT) of part numbered items of SE versus by Support Equipment Recommendation Data (SERD) number, causes major problems in the acquisition process."

Assumptions / Expectations. It was expected that AFSC and GD/FW would not tend to believe that PMRT of part numbers versus SERDS caused as much problems as AFLC would believe. In fact, AFSC and GD/FW would prefer this method due to AFSC being the implementing (developmental) command, and GD/FW normally working the developmental area with them instead of AFLC.

Findings. The overall mean score was 3.394, with a mean of 3.133 for AFSC, 4.000 for AFLC, and 3.125 for GD/FW. The Kruskal-Wallis H-statistic was 8.3697 with a

0.0390 associated p-value. The hypothesis that the p-probability distributions are identical was rejected.

Analysis. As expected, AFSC and GD/FW neither agreed or disagreed with the statement, but AFLC agreed that the PMRT process caused problems. There were significant differences between the levels of agreement for the three organizations as evidenced by the rejection of the hypothesis.

Interview Instrument Two

Interview instrument two consisted of the eight questions asked of the eight logistics/acquisition managers meeting the established criteria of "expert". Questions 14, 16, 17, and 18 were analyzed using the Delphi technique discussed in Chapter V. Responses to question 19 are provided in Appendix M. Questions 12, 13, and 15 are discussed below, but because of the variations of answers in the organizations and dependence upon type of support equipment being managed, no attempt was made at statistical analysis.

Question 12.

"What percent of the SE delivered to date has been delivered on-time?"

Assumptions / Expectations. The only assumptions made in this questions was that support equipment in general was to be discussed and no attempt would be made to isolate individual support equipment problem areas.

Findings. After discussions with the four experts assigned to AFSC, it was determined that they believed that approximately 86.25 percent of developmental support equipment was delivered on-time. The two experts from AFLC believed that about 96.50 percent of their common support equipment was delivered on-time and the two experts from GD/FW claimed 95 percent on-time deliveries.

Analysis. The findings listed above are well in line with what should be expected. There will almost always be those items of developmental support equipment, that by their very nature, will be late due to the instability of the weapon system. AFLC, although they should and did have a higher percentage of deliveries than AFSC, will always have a few items that because of procurement leadtime can not be delivered to support a weapon system delivery. The same reasons, as mentioned for developmental and common support equipment, would apply to the few items of SE delivered late by GD/FW.

Question 13.

"What percent of the SE delivered to date that has been delivered on-time, would have been late without micromanagement on your or a team members part?"

Assumptions / Expectations. The same assumptions and expectations as provided in question 12 apply for question 13.

Findings. AFSC experts agreed that of the 86.25 percent of developmental SE delivered on-time, only about

66.25 would have been delivered without micromanagement. AFLC estimated only 50 percent of their SE would have been delivered on-time without micromanagement and GD/FW estimated 75 percent.

Analysis. These findings appear to be within expectations, with the possible exception of AFLC. It is believed that AFLCs 50 percent on-time delivery without micromanagement may be an exaggeration. It is believed that a percentage more in line with AFSC and GD/FWs finding would be more likely.

Question 14.

"What do you believe is the most common cause of SE schedule slippage?"

Findings. Delphi Round One found all eight experts being interviewed agreed that instability of the weapon system design was the primary reason for support equipment delivery slippage.

Question 15.

"What is the average time required to place an item of SE on contract after initial receipt of order?"

Assumptions / Expectations. It was believed that items placed on order by AFSC would tend to take much longer to be contracted for than those order by AFLC or GD/FW. It was also expected that items placed directly on order with GD/FW would have the shortest contractual time.

Findings. Estimates by the four experts at AFSC showed that on average, it took 19.5 months from date of receipt of order at the SPO until on contract with GD/FW. AFLC experts claimed that on average it took them 11 months to place an item on contract and if the order was placed directly with GD/FW only about 6 months was needed.

Analysis. Again, these times seem fairly appropriate. It should take much longer to place an item of developmental equipment on order than an item of common support equipment. Also, it stands to reason, that if the middleman (AFSC or AFLC) is cut out by dealing direct with the company (GD/FW) all additional administrative time is alleviated.

Question 16.

"What is the primary cause of this time delay?"

Findings. Delphi round one found that 6 experts believed that contractual delays caused the lengthy periods of time required to place an item of SE on contract and two experts believed that micromanagement was the cause for the delay. Delphi round two showed a consensus by all eight experts that the overall cause of lengthy SE contractual times was in fact contractual difficulties.

Question 17.

"What do you believe is the number one reason for late support equipment delivery?"

Findings. Delphi round one determined that six experts believed that the reason for late support equipment delivery was caused by contractual difficulties and two believed that the cause was weapon system instability.

Delphi round two found a consensus of all eight experts agreeing that instability was the primary reason for late SE delivery.

Question 18.

"What can be done to alleviate this problem?"

Findings. Delphi round one found six experts claiming that the best way to alleviate late support equipment problems was to change the way organizations place items on contract and two experts believe the best way was to increase management attention. Delphi round two found a consensus of all eight experts that increased management in the early phases of the weapon system acquisition process would improve the delivery schedules for developmental support equipment and a change in methods of contracting would improve the delivery times of common support equipment.

Summary

Overall, interview instrument one and two show that there is no simple answer to the increasing cost (both time and money) of support equipment acquisition. Instead, there are a myriad of reasons, big and small, for support equipment arriving in the field well after the initial fielding of the weapon system. The two primary areas of concern, and thus those areas this research paper will look at in detail in the following chapters, is instability of weapon system design and current contractual procedures.

VII. Problems and Potential Improvements

Overview

Two major problems of the acquisition process were found during the interviews with eight experts in the logistics or acquisition field. It was a consensus of the experts that instability was the root cause of support equipment schedule slippages and late deliveries. It was also agreed that once an item of support equipment was initially placed on order the number one reason for lengthy delivery schedules was the time involved in the contracting process. This chapter will look at both instability and contracting with emphasis on improvements and alternative means of accomplishment.

Instability

Former Secretary of Defense Frank Carlucci, in an article on the acquisition process stated, "We all know what is fundamentally wrong with it: Time and again instability has been scored as its most chronic defect (8:4)." It was seen in Chapter VI that the number one reason for support equipment schedule slippage and late support equipment deliveries was instability. But what is meant by instability?

General Lawrence A. Skantze, former Vice Chief of Staff, USAF, once stated that the problems of instability are slipping schedules, changing requirements, and escalating costs (42:3). All of these problems are basically caused by changes to the acquisition process after the definition phase (paper phase) and occur during the "hardware bending" stages. As General Skantze puts it,

> changes are made to the original concept - sometimes without a lot of thought. We sacrifice the good while hunting for the best. And keep in mind that the better is always the enemy of the good. What you can get tomorrow looks so much better than what you're trying to produce and get out the door today. Changes like this disrupt the smooth progress in a program and, more important, cost us money. [42:3]

These changes not only cost us money, as General Skantze points out, but invariably cost us time.

Perhaps a definition of stability would be better than trying to define instability. Lieutenant Colonel John L. Clay, USAF, defined it as,

> Defense-acquisition stability is the fulfillment of planned expectations; that is, weapons are acquired as originally intended. Further, stability can be measured by the degree to which planned objectives - in particular those associated with performance, support, resources, and time - are realized as the weapon is acquired. [9:5]

Clay goes on to suggested that there were five conditions necessary to create an ideal state of stability for acquiring any weapon system:

> 1. A few, key system objectives, consistent with national military strategy, force objectives and user needs, are correctly identified, understood and held constant.

2. Cost, schedule, and performance estimates are realistic; i.e., the probability of overperforming is roughly equal to the probability of underperforming.

3. Trained and experienced personnel are assigned to the program and direct their energies to achieve program objectives.

4. Resources approved in the planning phase are provided unless the program fails to achieve specified goals.

5. Each commitment to complete an acquisition task is fulfilled (9:5).

Each of these five conditions can be restated in two fundamental terms. Stability requires quality planning and disciplined execution. Therefore, if instability is the root problem, stability is the solution. In 1983, Air Force Systems Command investigated ways to shorten the acquisition process and reduce costs. This study was referred to as "Affordable Acquisition Approach (AAA)". This study reviewed cost and schedule changes for 109 acquisition programs and concluded,

> ... that program instability (large unplanned changes in program funding and schedule) is the major causative factor of cost and schedule growth. [41:6]

Lieutenant Colonel Clay suggested that there were eleven specific causes (there are actually more, but these are the most problematic) leading to instability. These causes, referred to as "destabilizers", each threaten program stability, and hence cost and schedule, by degrading either planning or execution of the acquisition process. It is beyond the scope of this research to delve too deeply in this one area, but a brief explanation of these destabilizers should be beneficial. They include:

1. Faulty Requirements. Faulty requirements are mismatches between formal performance objectives and either the user's need, industry's capability, or reasonable affordability.

2. Strategy Disconnects. National objectives determine security objectives which, in turn, dictate military strategies. ideally, the Executive and Legislative Branches agree on these strategies and on this basis Congress then funds military forces.

3. Optimistic Schedules. Schedules organize program activity and are, therefore, critical to stability. Hundreds of discrete, interdependent tasks are involved and estimating the length and logical sequence of each one is not easy. The fact that schedule variances occur should not be surprising.

4. Poor Cost Estimates. Inaccurate estimates can result from the inability to predict technological advancements, task complexity, economic conditions, schedule requirements, support environments, or system employment concepts.

5. Inadequate Skills. Successful execution of an acquisition plan depends on the competence of the acquisition team. The DoD has often been criticized for a perceived less-than-adequate skill level among acquisition personnel.

6. Reporting Requirements. Successful execution of an acquisition program requires a policy of limited reporting and small high quality staffs. Neither of these two policy criteria are followed in most DoD programs.

7. Unfulfilled Baselines. Baseline commitments are too often unfulfilled during execution. Changing requirements, unachieved performance, and missed schedules are closer to the norm than the exception in DoD programs. This is a failure between the program manager and senior management.

8. Plan Ambiguity. Programs with ambiguous plans (program management plans) will suffer instabilities since execution can not be disciplined. This is a failure between the program manager and his or her team members.

9. Micromanagement. Although decentralized management is an acknowledged virtue, too much micromanagement can frequently cause disconnects. This is especially evident in the program manager position.

10. Contractor Buy-in. These include "optimistic proposals" and "trust-me tactics" often proposed by contractors.

11. Changing Budgets. of all the sources of instability, changing budgets are the best documented and, perhaps, most problematic. Any deviation from the amount or timing of funding originally approved for a program will cause major disconnects (9:6-9).

By necessity, weapons push technology; thus, performance, cost, and schedule uncertainties, to some degree, are a fact of life. Threats to national security evolve in unpredictable ways, forcing adjustments to requirements. The Constitution gives the Congress sole authority to fund military programs; the Congress will almost certainly continue to review and modify DoD weapon-budget requests each year. Until such time as each weapon systems acquisition program can be guaranteed reliable funding, planning, and system configuration, as well as continuity in management, the acquisition process will continue as is. Significant improvements in the acquisition process seem unlikely without added stability.

Three areas of stability improvement were mentioned by persons being interviewed for this research paper: streamlining, baselining, and standardization. Each will be discussed in this chapter.

Streamlining. The Federal Acquisition Regulation (FAR), section 7.101, defines "Acquisition Streamlining" as,

> any effort that results in more efficient and effective use of resources to design and develop, or produce quality systems. This includes ensuring that only necessary and cost-effective requirements are included, at the most appropriate time in the acquisition cycle, in solicitations and resulting contracts for design, development, and production of new systems, or for modifications to existing systems that involve redesign of systems or subsystems. [19:7.101]

A simpler to understand definition of acquisition streamlining is found in DoD Directive 5000.43 which says that it is any action that results in more efficient and effective use of resources to develop, produce, and deploy quality defense systems and products (15:2-1).

Streamlining the acquisition process is merely a buzzword for proper management. Numerous articles and regulations have been written in the past defining and refining acquisition streamlining, but they can all be condensed into one basic concept - any change or modification to the acquisition process that allows the delivery of a more capable, effective, reliable, supportable, and affordable weapon system. Streamlining initiatives can range from increasing competition to sole source approval; reducing costs to buying more expensive items; avoiding risk to accepting increased risk. There is no definite way to streamline the process. It has been stated several times in this research that no two weapon system procurements are the same, and because of this, there are no two streamlining procedures that will work the same in any two procurements.

What can be agreed upon in any streamlining initiative is that it will only work if two additional criteria are met. First, the services and industry must work in unison and second, the initiatives must be implemented in harmony with other processes and not implemented at cross purposes. For example, to initiate the use of warranties to ensure an improvement in quality is an accepted method of streamlining. The cost of a warranty can be covered by streamlining; i.e., not imposing how-to-manage military standards. Risks and costs would be reduced because managers could devote more time elsewhere. To force a contractor to provide a warranty, reduce costs, and improve quality can be considered contradictory.

Mr. B. A. Hardesty, in an article titled "The Streamlining Initiative: Removing Barriers to Productivity", described streamlining six ways (33:6-9):

> 1. Streamlining means to remove barriers to a smooth flow. We need to remove barriers to productivity.
>
> 2. Streamlining means to eliminate turbulence. We need to eliminate adversarial relationships.
>
> 3. Streamlining means to change attitudes.
>
> 4. Streamlining means to make simpler or efficient. We need to simplify specifications, military standards, management systems, data requirements, RFPs, contracts, etc. More importantly, we need to make their applications more efficient.
>
> 5. Streamlining means to reduce to a minimum. We need to reduce costs and preclude cost overruns.
>
> 6. Streamlining means to strip of nonessentials.

It is important to note that acquisition streamlining is a philosophy. There are no absolutes or guarantees as to what is good or what is bad. The Air Force intends to encourage innovation and allow flexibility in acquisition with the hopes of streamlining the process. It would be very optimistic to expect to ever reach the point in the acquisition process again where the Air Force could build a fighter aircraft like the Navy F-4, in 1955, with only two pages of specifications, or the B-24 Liberator which was placed on contract in March 1939 and flown in October 1939 (33:8). However, it should not be too optimistic to expect some improvements in how the government does business today.

Many of the less useful or counterproductive initiatives present in the acquisition process today, started as "quick-fix" solutions to problems. Congress and the DoD have found it necessary over the last several years to respond more and more frequently to reports of overcharges, overspecifications, and weaknesses in the acquisition process by the press and public. Each time some "quick-fix" was found to mollify the press. Unfortunately, these mollifiers are still embedded in our system. What is needed now are further steps to improve acquisition personnel and to streamline the acquisition process. Many experts on acquisition have talked about acquisition streamlining ever since 1984 when former Deputy Secretary of Defense William H. Taft first proposed the initiative, but it seems that all the trends are in the opposite direction.

Instead of a simplified, streamlined process, the policies of the last eight years or so have instituted more detailed rules, more certifications, more reporting cycles, all in an atmosphere of less trust. If those trends continue, the outlook for improvement in the acquisition process is bleak (48:41). Colonel Gene S. Bartlow had this to say about the streamlining paradox of paperwork,

> A wise observer comments that in the zeal to clamp down on excessive costs, the paradox is that costs are rising. A partial reason is the paperwork involved - investigations, classification, inspection, and all constraints adding to the cost of doing business. A perfect cost system that scrutinizes the cost of every nut, bolt, and screwdriver is going to add greatly to the cost of these items. Weapons programs must now run a gauntlet of paperwork, which adds far more to cost than is saved by the safeguards. If the trend continues, we could expect that by the year 2000 not a single case of waste, fraud, or abuse in weapon system acquisitions will be reported in the Air Force *and not a single weapon procured*. Total control results in total immobility.

Baselining and Cost Capping. Program baselining has been an Air Force policy since 1983 and is officially embodied in Air Force Regulation 800-25 (AFR 800-25), Acquisition Program Baselining. Air Force Systems Command initiated the concept in the late 1970s as a sort of cost "contract" between the program manager and the AFSC commander. Baselining was initially designed to improve stability of the acquisition process for selected programs. Baselining was not meant to be just another form of program reporting (30:70).

A baseline, when approved, is intended as an agreement between the program manager and senior management. In effect, the former commits to achieving the specified objectives, and the latter promises to provide specified resources (budget, manpower, and facilities). Simply stated, we get all the major players (operational command, development command, support command, and training command) to accept and agree up-front, on the requirements, the program content, and the cost of the specific program. Once this agreement is signed, no changes are allowed unless everyone agrees that the changes are vital to the programs' success.

Major program baselining is a management technique designed to enhance program stability by adding a measure of control over critical program parameters. Critical parameters for a major defense acquisition program include cost, schedule, and performance. Once the critical parameters are established, agreed upon, and formalized (usually during the engineering and manufacturing development phase and no later than the beginning of the production phase), the program manager has authority to manage the program within the specified baseline parameters.

DoD Directive 5000.45, Baselining of Selected Major Weapons Systems, established acceptable margins of deviation for the program. The program manager must report to the Service Secretary and the Service Acquisition Executive (SAE), who in turn reports to the Under Secretary of Defense for Acquisition, any deviations in the program baseline resulting in: 1) 15 percent increase in the cost parameter for the development phase; 2) 5 percent increase in the cost parameter for the production phase; 3) 90 day missed schedule parameter for either phase. It should be noted that the parameters for performance are not expected to be met and no reporting is required (30:75). Instability accepted!

<u>Standardization</u>. As early as 1973, the Department of Defense was moving toward the standardization of its equipment. DoD Directive 4120.3, issued on 6 June 1973, established the Defense Standardization Program. The program's objective was to control item proliferation by:

1. preventing duplicative and overlapping descriptions of materials and services;

2. fostering the use of existing technology and design features to satisfy new equipment and systems requirements;

3. establishing uniform type grades, classes, and sizes of items and levels of performance requirements; and,

4. developing methods for systematically reviewing inventory items to reduce or eliminate unnecessary varieties and sizes.

Therefore, the overall goal of standardization in DoD is to avoid the proliferation of equipment models designed to perform similar functions. For example, in the Air Force, a 1957 study discovered 594 different type, model, series diesel-engined generators in the inventory. The study further found that only 38 were functionally different and actually required for Air Force commitments (40:205).

By recognizing the possibility for the use of standardization or common support equipment, each project may benefit in any of the following ways:

1. reduced item cost through the use of readily available items;

2. reduced assembly and installation costs for items as a result of standard tooling;

3. more predictive reliability through the use of items with established service histories;

4. improved maintenance by eliminating odd or unusual items;

5. simpler logistics support;

6. reduce the number of line items in supply and the pipeline;

7. lower cost due to economy of mass production and larger quantity purchases;

8. reduce maintenance and operational training and technical manual requirements; and,

9. provide higher operational effectiveness.

All of these factors contribute to the potential for meeting schedule or cost goals by eliminating different items with similar functions. Basically, if the wheel does not have to be re-invented in every program, more design effort can be applied in areas of greater payoff. The essence of standardization is making pertinent, economic, and flexible selection of standards to be promulgated, and acceptance of those choices by government and industry. However, lack of time during source selection and lack of knowledge early-on regarding specifics of design, personal biases, a risk-adverse environment, and other factors enter into the judgement of which selection is correct (46:23).

Instances such as the diesel-engined generator mentioned above are, in a large part, related to the inadequacies of the support equipment recommendation data (SERD) review process. As weapon systems escalate in cost and as acquisition processes lengthen, early planning for support equipment planning and logistics will become more critical. The continuation of the trend to increase standardization will provide the program manager for support equipment with more management flexibility and a cost effective means to efficiently meet operational requirements in a timely manner.

Contracting

It was seen in Chapter VI that, experts agreed, the number one cause for delay in the procurement of an item of support equipment, after authorization, was contracting. As a system progresses through the acquisition cycle, the application of competition changes in two principal ways: in the type of benefits sought and in the cost, either money or time to support it. The net effect of these factors varies from program to program. This section will look at competition, in the arena of common and peculiar support equipment acquisition, and then show several acquisition strategies designed to decrease the cost of procurement, the time involved, or both.

Common Support Equipment. Competition in this sense is particularly applicable to the common support equipment acquisition process. There are many common support equipment items for which there are several established sources of off-the-shelf items capable of competing on both design and price. Therefore, the common support equipment end item, in most cases, is a proven product with little or no development required to meet the identified mission. Consequently, sufficient technical data may easily be obtained on which to base competition in the engineering and manufacturing development phase of the common support equipment life cycle. Such availability virtually eliminates the concept exploration and demonstration and validation phases of the acquisition process and provides the program manager with additional flexibility on both schedule and cost. In these cases, a firm fixed price production contract, based on performance specifications in the support equipment recommendation data (SERD) package, may be formally advertised and competed.

These contracts normally include a provision for technical evaluation (TECHEVAL) on both design and performance parameters. Such testing at this point is critical to the eventual operational success of the support equipment item, as it is intended to ensure the compatibility with existing aircraft and an interchangeability, both physically and in performance, with similar common support equipment items. The verification of the design and performance specifications are particularly important to the end user who may be adversely affected by the results of multiple sourcing such as:

1. additional spare parts requirements;

2. lack of interchangeability for either the end item or component parts; and,

3. increased logistics element requirements such as manpower, training, technical manuals, etc.

There are, however, those cases in which common support equipment items must progress through all stages of the acquisition process. Even in these programs, it is the exception to encounter a sole source procurement to the prime weapon system contractor. A cost plus incentive type development contract is normally used to compete the common support equipment design development, and a subsequent competitively awarded firm fixed price contract is used to compete the production.

In those exceptions when a support equipment contract is awarded to the prime weapon system manufacturer, it is normally for the modification of a proposed item of peculiar avionics equipment on a developing weapon system, and the modified equipment is so configured as to replace existing automatic test equipment (ATE) as well as meet the identified mission.

Peculiar Support Equipment. In applying competition to the acquisition of peculiar support equipment, several complications are immediately apparent. First, peculiar support equipment is demand dependent on a developing weapon system for which a definitized product baseline is required prior to the development of the support equipment item. However, in most cases, the peculiar support equipment acquisition process is initiated at a point in the weapon system development where the allocated baseline is barely defined. Without definitive weapon system specifications, it is clearly difficult for a second source to exist competitively. Virtually all items of peculiar support equipment, other than non-complex GFE/LM, are contracted for with the prime weapon system manufacturer.

Secondly, there are some negative aspects of competition which act as disincentives for its use. They are an increase in total program cost, a lengthening of the overall schedule, an increased program complexity, and a requirement for an additional management effort. These delays may occur as a result of the time required for testing and source selection, the time needed to qualify an additional contractor and the additional management and administrative time requirements resulting from increased program complexity. Since program costs have a tendency to rise with inflation, if not faster than inflation, the increased program length produces the risk of additional costs.

For every kind of competition an additional investment may be required over what would be needed for sole source procurement even without schedule slippage. This is due in part to the increased management requirements generated by the increase in the number of contractors. Additional planning, monitoring, and administration is required to ensure that all sources are performing in accordance with the program guidelines.

These drawbacks are magnified by the fact that the support equipment acquisition process trails that of the weapon system acquisition. To avoid the potential impact of these factors, virtually all peculiar support equipment is initially procured from the prime contractor on a negotiated fixed price production contract for which the research and development was conducted as a provisioning line item on the weapon system contract. In contrast, the reprocurement of peculiar support equipment often occurs through the use of breakouts (see below).

<u>Multi-year Contracts</u>. Multi-year contracting has, in the past, been used primarily for the procurement of goods and services. However, in recent years multi-year contracts have been used in the procurement of support equipment and spare parts.

The Navy was the early pioneer in the use of multi-year contracts in large shipbuilding contracts, because the quantities were relatively large and the risk of cancellation very low. Additionally, multi-year contracts were relied upon heavily to achieve rapid buildup of production capacity for critical items to support the Vietnam war. The Acquisition Improvement Program, instituted by former Deputy Secretary of Defense Carlucci, defined 32 initiatives designed at shortening the acquisition process, increasing readiness, providing cost savings, and strengthening the industrial base (3:19-20). The use of multi-year contracts was one of the 32 initiatives designed to improve the process. Multi-year contracts, when used for major weapon system acquisition, saved the Air Force alone more than $2.5 billion in fiscal 1984 (42:4). This savings included the amount saved on the F-16 aircraft which was the first USAF program to be provided with multi-year funding.

This long-term funding has afforded contractors a high degree of production planning stability that is vitally needed. With these dedicated funds, contractors are able to purchase raw materials and subassemblies in large quantities, efficiently and effectively schedule production runs, and adequately plan for future expansion of production facilities if needed. Perhaps most importantly, this funding allows for the procurement of long lead time materials. These and other benefits would be realized in contrast to the numerous uncertainties and delays associated with annual appropriations.

Criteria for Multi-year Contracts. The criteria for multi-year contracting of support equipment are identical to those of major weapon system acquisitions. Multi-year contracts are applicable when one or more of the following criteria are satisfied:

1. Benefit to the Government. The use of multi-year contracts must show considerable benefit to the government in terms of cost savings, schedule improvement, or standardization. Each proposed multi-year contract should be evaluated on its own merits, weighing the margin of savings against the added risk and other uncertainties. The savings

should be high enough to offset any additional risks of entering into a multi-year contract.

2. Stable Design/Configuration. The design of the support equipment item must be stable, and the configuration baselined. All the design, development, and qualification testing should be complete. This will eliminate the costly modifications in the out-years of the contract resulting from design change.

3. Stable Requirement. The need for the support equipment must be stable throughout the terms of the contract. There must be a requirement for the support equipment items programmed for the life of the multi-year contract. Any decreases in the requirements can often times increase the unit cost of the support equipment item, and reduce the potential savings of the contract.

4. Stable Funding. The system program office (SPO) must be committed to the program to insure sufficient funds will be available to complete the multi-year support equipment contract. In the case of cancellation, the government is liable for the total amount of the cancellation ceiling imposed on the contract. The funding for support equipment is often times driven by the priority of the weapon system it supports.

5. Degree of Cost Confidence. Prior to the approval of a multi-year contract, the buying agency is required to present estimated cost data providing a substantial cost savings to warrant increased risk. The estimates for the contract costs must be realistic.

6. Degree of Confidence in Contractor Capability. There should be significant confidence in the contractor's performance in terms of meeting the delivery schedule. The contractor should have the necessary resources to deliver all other support items in accordance with the contract. However, the contractor need not have produced the support equipment items to be awarded the contract.

Benefits of Multi-year Contracts. The benefits of multi-year contracts has the potential for tremendous cost savings. The principle cost savings can be realized by reducing the short term costs, while improving the contractor's ability to perform in the long run. A contractor is able to make large, volume purchases of materials and components to cover the total program requirements instead of making small yearly purchases. Not only will the use of multi-year contracts result in lower per unit costs, but will also avoid the expensive administrative costs associated with the stop/start of annual contracts. As a result, the contractor is able to pass along the cost savings in the form of lower support equipment acquisition costs.

Another source of cost savings attributable to multi-year contracting is program stability. The contractor is able to stabilize the workforce, which will result in greater production efficiency in the outyears of the contract. Therefore, multi-year contracts will result in a more consistent production quality and reduced waste.

A third benefit of multi-year contracting is the increased standardization of the support equipment. The contractor is able to purchase large quantities of identical piece parts and materials, which results in a standard end item. The benefits of standardization can be most realized in the logistics support area. A standard support equipment item lowers the training, technical data, and spare parts requirements.

Most importantly to this research project, is the benefit from multi-year contracting which allows for the decreasing of support equipment delivery times. Frequently, parts and materials have an extremely long procurement leadtime. By allowing the contractor to purchase items in advance the yearly parts procurement process would be circumvented.

The benefits of multi-year contracts are substantial, but the risks can be equally large if the techniques are incorrectly applied. Multi-year contracts are a collection of techniques rather than a rigidly defined method. Any potentially beneficial situation may become a disadvantage if the multi-year contract is misapplied.

Disadvantages of Multi-year Contracts. A major disadvantage of multi-year contracts is the risk associated with contract cancellation. Though the risk of cancellation is relatively low, critics feel the high cancellation costs, coupled with other less significant disadvantages, give reason to avoid using multi-year contracts.

A second disadvantage of multi-year contracts is reduced flexibility. Since multi-year contracts are long term commitments, they reduce the controllable portion of the support equipment budget. The controllable portion of the budget is the amount not mandated under law or obligated by contract. Frequently, changes in technology are ignored because of multi-year commitments.

The weapon systems and support equipment of today are constantly pushing the state of the art envelope. As a result, the hardware is changing frequently. Special contract provisions are included in multi-year contracts to cover changes, but problems arise when the change is beyond the scope of the contract. In this case, the contractor gains the leverage in renegotiating the price. The government is in a "take it or leave it" position, the contractor is able to dictate price. This erodes the initial cost savings of the multi-year contract.

Another problem arises with changes in multi-year contracts. As stated earlier, one benefit of multi-year contracts is to allow the contractor to make large component purchases up front to cover the term of the contract. In the event of a change, these parts may become obsolete. The contractor will recoup the cost of these parts during the renegotiation of the contract. This is an example of a potential advantage becoming a disadvantage.

Multi-year contracts have proven to be a valuable tool in the acquisition of support equipment, and can result in significant cost and time savings under the right circumstances. The evidence has shown the good outweighs the bad, provided a multi-year contract is utilized properly.

Breakout Procurement. The policy of breakout procurement in the acquisition of support equipment is identical to component breakout in the acquisition of weapon systems. Therefore, the policies and procedures are the same. Component breakout, or breakout procurement of support equipment, is a special contracting method in which the system program office (SPO) purchases an end item of support equipment directly from a manufacturer or subcontractor, or through competitive procurement, and furnishes the component to the prime contractor as government furnished equipment for incorporation into the weapon system end item. By procuring the support equipment, the government is able to save the indirect cost and profits charged by the prime contractor to procure the item. Primary consideration for breakout procurement should be given to the items which provide the greatest potential cost savings at the least amount of risk.

Like multi-year contracting, component breakout/breakout procurement is a fairly new idea. As the weapon systems and support equipment became progressively more sophisticated, the prime contractors discovered they did not have the capability to furnish all the component parts of the system and the necessary support equipment. As a result, the prime contractor sought the assistance of subcontractors and vendors to supply parts and certain support equipment. The prime contractor assumed the role of integrator as opposed to sole producer as was the case in the past. However, this new role was not without a price. The prime contractor adds material costs, material overhead, subcontractor costs, as well as a second tier profit factor to the government's total cost of the weapon system and support equipment.

Support equipment breakout is accomplished in two ways by Air Force Systems Command. The first method is to award a contract directly to the support equipment manufacturer and by-pass the prime contractor. However, the hope is that once the first unit is purchased from the prime contractor, a competitive procurement can be used for any additional quantities. The second method, and far most common, is to award contracts to small disadvantaged businesses for the manufacture or procurement of non-complex support equipment. The Air Force is still working with the prime contractor to determine the requirements, but the hardware is purchased from another business.

Criteria for use of Breakout Procurement. In order for breakout procurement to be successful in the acquisition of support equipment, the following criteria should be met:

1. Cost Savings. The breakout procurement should result in substantial cost savings for the government. Prior to considering a breakout procurement, a realistic estimate of the cost savings should be made. However, establisning the cost estimate is not an easy task, but is essential to successful breakout. Without such an estimate, the chance of making a poor breakout decision is increased.

2. Stable Configuration. The support equipment item being evaluated for a breakout procurement must have a stable configuration. The design of the support equipment and the system hardware should be finalized. A breakout procurement should only be made if the decision does not jeopardize the quality, reliability, performance, or timely delivery of the support equipment item.

3. Technical Risk. The technical risk of a breakout procurement should be low. An assessment of the risk is essential, and an analysis of the technical, operational, and logistics support areas must be considered prior to breakout decision.

Benefits of Breakout Procurement. The major benefit of a breakout procurement is the potential for cost savings. The government procures the support equipment item directly from the subcontractor or from a disadvantaged small business, thus eliminating the middleman role of the prime contractor and associated charges. In addition to their ability to maintain quality, subcontractors and disadvantaged small business have less overhead than major manufacturers and thus can offer greater savings on the same production lots of support equipment.

Another advantage of breakout procurement, and the one most relevant to this research, is the shortened lead time available by use of subcontractors and disadvantaged small businesses. An ordering agreement is negotiated between a system program office and the firm(s), which allows the Air Force to order between a minimum and maximum dollar amount over several years. As a result, when a requirement for a breakout procurement exists, the items can be ordered quickly. An order for a support equipment item through a prime contractor can often take over two years, most of which is attributable to the administrative lead time. This same item can most often be delivered by a small business in about one third the time.

Disadvantages of Breakout Procurement. The major disadvantage of breakout procurement in the acquisition of support equipment is the limited scope of application. Breakout procurement is currently being used primarily in the acquisition of relatively inexpensive, non-complex items and for second units. Therefore, the opportunity for substantial cost savings is limited, due to the low cost of each item.

The primary reason breakout is not used more often is because the risk is so great. By breaking out the support equipment item, the government assumes all the technical, schedule, and cost risks, and assumes the role of developer and integrator. Presently, the government pays the prime contractor to manage the entire process, and provide the support equipment as contractor furnished equipment (CFE). They are responsible for every aspect of the support equipment acquisition process; the technical interface between the system and equipment, the logistics support considerations (calibration, technical data, spares, etc.), configuration management, testing, contractual activities, and a myriad of other tasks. If the government were to attempt this method, the entire process would be too manpower intensive. For example, the F-16 program currently has approximately 3,600 contractor furnished equipment SERDs, acquired and developed by General Dynamics, involving hundreds of different subcontractors. If the government were to attempt to breakout these items, it would require management of 3,600 support equipment acquisition processes concurrently. A major criticism of the acquisition process of today is that it is so cumbersome and time consuming. An incorrect breakout procurement would only proliferate this problem.

Government Furnished Equipment/Local Manufacture (GFE/LM). Local manufacture is the fabrication of items at either the depot or intermediate maintenance level. In the past, local manufacture has been used primarily for the fabrication of simple aircraft parts (hoses, maintenance jigs, cables, etc.). However, in response to the publicity concerning the acquisition costs of non-complex support equipment items, local manufacture has become an alternative method. The local manufacture process is nearly identical to the breakout process, except the items are fabricated by government personnel in government machine shops instead of small private businesses. The use of local manufacture has not been used too often in preceding years because of conflicting Department of Defense and Air Force rules and regulations. Even after DoD 4000.19-R was changed in March of 1984 to read,

> DoD Components shall request interservice support from another DoD Component or federal agency on a reimbursable basis when the capabilities exist or can be made available and that means of support will increase economy and effectiveness to the overall advantage of the Department of Defense. [18:B,1]

Local manufacture has been used most successfully by the F-16 system program office (SPO). Currently the F-16 SPO is using an interservice support arrangement with the 4950th Test Wing, Wright-Patterson AFB, Ohio, for the fabrication of non-complex support equipment items. They currently have approximately 55 items or SERDs being fabricated.

General Dynamics Corporation submits SERDs to the SPO with a recommended Part II solution of local manufacture. Once the SERD is approved as local manufacture, General Dynamics prepares the engineering drawings and sends them to the 4950th Test Wing for first unit fabrication. After the initial fabrication of the support equipment, the item is returned to General Dynamics for testing, or tested by the Air Force directly when possible. When the item passes the initial testing, the necessary quantities are fabricated by the 4950th Test Wing and sent to the field for support of the F-16 aircraft. As part of the agreement, General Dynamics includes a copy of the drawing(s) in the technical data. With a copy of the drawing(s), the field units can manufacture the support equipment item as the need arises.

Criteria for Use of Local Manufacture. The criteria for use of local manufacture are identical as for breakout procurement. AFLCR 65-5, Air Force Provisioning Policies and Procedures, states, support equipment items will not be designated as local manufacture unless the following five conditions apply: 1) cost effective analysis must verify decision; 2) material required and manufacturing data must be available; 3) the process of manufacture must not require unauthorized tools, equipment, or skills; 4) quantities required do not impose any undue workload; and 5) item can be locally manufactured/modified by need date (23:41-1).

The fabrication of an item must demonstrate increased economy and effectiveness to the overall benefit of the Department of Defense. If not, local manufacture is not a suitable acquisition method. The support equipment item must have an urgent need which can not be satisfied by any other method.

Benefits of Local Manufacture. The primary benefit of using a local manufacture is the potential for significant cost savings. The cost savings are realized by utilizing the government facilities, by reducing the overhead costs, and all the administrative and clerical costs involved in the acquisition of support equipment. The system program office (SPO) sets up a fund site, which the 4950th Test Wing uses in a reimbursable method to cover the cost, and retains a small percentage for the upgrade of equipment. The cost savings attributable to this method of acquiring non-complex support equipment is substantial. The average cost savings is estimated by the F-16 SPO to be approximately 80 percent.

Another benefit of local manufacture, and the most important to this research, is the reduced lead times. Once the drawing is presented to the 4950th Test Wing and the component parts are received, the item can be fabricated in a matter of weeks. These lead times can be reduced so dramatically because there is no formal interservice contract, but only an agreement. Initiating local manufacture of an item of support equipment requires minimal effort in comparison to a contractor furnished equipment (CFE) item of support. This local manufacture virtually eliminates the administrative lead times associated with other forms of support equipment procurement.

Disadvantages of Local Manufacture. As was the case with breakout procurements, the primary disadvantage of local manufacture is the limited scope of application. This method can basically only be used on non-complex support equipment items. This is a major limiting factor of this method. Also, before a local manufacture method can be used, the government must prove beyond a reasonable doubt that it is in the best interest of the Department of Defense and results in a overall advantage.

Basic Order Agreement and Provisioned Item Order. Two other forms of contracts or methods of contracting that could be beneficial in the procurement of support equipment are the basic order agreement (BOA) and the provisioned item order (PIO).

The basic order of agreement (BOA) is not really a contract type, but rather, an agreement as to the terms and conditions that will apply to placing orders in future contracts when specific procurement needs arise (3:4-18). This form of contracting agreement could easily be modified for use in support equipment acquisition of common support equipment to eliminate the need for pricing for follow-on orders received within a certain time span. Currently, each order or request must run the complete procurement cycle and this cycle can be quite time consuming. Follow-on orders received within an established time frame could circumvent part of this cycle by having a BOA established. This basic order of agreement could establish a set, or negotiated, price for a specific piece of support equipment that would be valid for a specified length of time.

The provisioned item order (PIO) is currently used to order spare parts through the provisioning process; these orders may be added unilaterally to a production contract to permit timely (concurrent) manufacture of the initial spare parts while the production parts are being made (K1:11). This form of provisioning is often avoided because the order is frequently placed, and occasionally even received, prior to a firm price being established (undefinitized).

Either of these two methods would be especially helpful in the acquisition of support equipment for foreign military sales (FMS) programs. Normally, support equipment can not be offered or purchased by a foreign government until such time as the Air Force has approved or purchased the equipment. The support equipment manager could save a considerable amount of time by placing orders for FMS along with an associated contract for the Air Force. Additional research needs to be accomplished in each of these areas to verify the usefulness and legal ramifications of each.

VIII. Conclusions and Recommendations

Overview

Because of the way our system works today, we have become predisposed to buy so-called "rubber on the ramp," or the highest performance capability we can get. Until recently, we have given precious little thought to the funding and procurement of logistics support items. What we are doing is much like buying an expensive car without a spare tire, jack, or established maintenance plan.

For years we have traded off real combat capability, an illusion of total numbers in the inventory, not of sorties that can be flown or ordnance that can be delivered. In the past we purchased, say, 100 new airplanes but very few spares or support equipment. Typically these systems have promised an operational readiness rate of about 75 percent; just as typically, this rate has dropped off almost immediately because of spares shortages or maintenance problems. So in fact we have not 100 airplanes but only half that many that can actually go to war or meet our peacetime operational and training requirements.

Two primary solutions to the problem come immediately to mind. We can either build systems that are reliable and durable enough to obviate the need for additional logistics support, or we can act to insure that when we buy new weapon systems, we also secure the logistics support they must have.

Obviously, building systems that are so durable that maintenance and spares are unnecessary, the logistically ideal aircraft, is a long-term goal. The short term alternative, on the other hand, seems simple enough. For the same dollars, we could purchase 90 airplanes instead of 100 and use the remaining funds to buy as much increased reliability as technology could provide; to the extent that such reliability was unachievable, we could use the money to procure adequate spares and support equipment. We could thus have perhaps 90 percent of 90 airplanes, or 81 combat-ready systems, instead of 50 of 100 (39:3-4).

We must remember that DoDs primary goal is to provide our fighting forces the best and most capable weapon systems possible, at the most efficient cost, on time, and fully supportable (10:13).

Weapon System Acquisition

Research Objective One. Analyze the support equipment acquisition process as it relates to the overall Department of Defense weapon system acquisition process.

Synopsis. The weapons system acquisition process is in trouble because it has become increasingly enmeshed in American political procedures that are glaringly at odds with what is required to develop advanced technology. The best weapons projects unify authority and power in the single individual or small team; by contrast, American politics fractures power across two branches of government and countless agencies within each one. The best weapons projects are marked by sharp trade-off decisions that can be made only under conditions that encourage flexibility; American politics avoids sharp trade-offs in favor of consensus, but political bargains, once struck, can be anything but flexible. Program management has become an increasingly political undertaking. Unfortunately, the steps that program managers and military service staffs must take to manage weapon projects politically run counter to what they should want to do to manage their projects technically, efficiently, and effectively (38:102).

As seen earlier in this research paper, the root cause of late deliveries and shortages of support equipment is instability of the weapon system acquisition program. Allen Puckett, former Chairman and Chief Executive Officer of Hughes Aircraft, has formulated "Puckett's Law" to describe the impact of advances in microelectronics technology on system design. According to that law,

> technological growth has been so rapid and so profound that a designer of electronics equipment can improve a specified design each year by a factor of nearly two over the previous year; that for a given cost and performance, weight can be reduced by a factor of two; that for a given weight and cost, performance can be increased by a factor of two; and that for a given cost, weight, and capability, reliability can be increased by a factor of two. [34:14-15]

Although highly beneficial to the weapon system, these same design enhancements continually force the design and development of support equipment into the background. Performance and capability consistently receive the limelight of attention and management during the early stages of the acquisition process because they are paper concepts (easy to see, but extremely hard to prove or disprove). These paper concepts set the stage for the remainder of the acquisition process, regardless of their optimistic values. It is not until the engineering and manufacturing development stage of the acquisition process that support equipment begins to be truly considered as a necessary item. At this time, because of the milestones and schedules established by the paper concepts, support equipment design and development begins to play a game of catch-up and all too often, this game of catch-up never quite succeeds.

Integrated Logistics Support

Research Objective Two. Analyze the support equipment acquisition process as it relates to the integrated logistics support (ILS) program and the logistics support analysis (LSA) concept.

Synopsis. Thomas Jones, in an article titled "Logistics and the Military End Game" (34:13), stated,

> One of the members of Julius Caesar's legions charged with the business of supply is alleged to have lamented, "Logisticians are a sad and embittered race of men who are very much in demand in war and who sink resentfully into obscurity in peace."

Two thousand years later, however, with the cost of operating and supporting major weapon systems exceeding that of acquiring them, logisticians can ill afford to sink into obscurity. Today, and for as far into the future as one can reasonably see, logistics considerations must command center stage. Yet, until such time as the acquisition process has reached the engineering and manufacturing development phase, logisticians barely are permitted in the balcony area, much less center stage. Even after the weapon system is stabilized and ready to enter the production phase, logisticians are little more than seconds at a dress rehearsal. It is not until the system enters the deployment phase that the logistician makes it to center stage, and then, he is all too frequently perceived as the villain.

Two things must be re-initiated in the integrated logistics support program before the logistician can become if not a hero, at least a supporting actor. First, Dr. F. Grosvenor Plowman's "five rights" of a logistics system must be established and accepted. These five rights include the supply of the *right product* at the *right place* at the *right time* in the *right condition* for the *right cost* (43:11). It must be kept in mind that without adequate support, a newly purchased weapon system will quickly take on the traits of a static display - impressive to look at, but immobile and impotent. Second, total cost analysis is the key to managing the logistics function. Management should strive to minimize the *total* costs of logistics rather than the cost of each activity.

Attempts to reduce the cost of individual activities may lead to increased total costs. Reductions in one cost invariably lead to increases in the costs of other components. Effective management and real savings can be accomplished only by viewing logistics as an integrated system and minimizing its total cost given the operational need of the service (43:113).

Support Equipment Acquisition Process

Research Objective Three. Define the support equipment acquisition process as currently being implemented by the United States Air Force.

Synopsis. Chapter IV described the support equipment acquisition process as it exists today. Back in 1906, when the Army Signal Corps requested bids for a "flying machine," the specification requirements consisted of one page. The flying machine had to be easily assembled and disassembled (in less than one hour) and capable of carrying two persons 125 miles at a speed of 40 miles per hour (44:3). Although no mention was made of support equipment, it was a given that any required tools would be of a common, easily obtained type.

Today, in a drive to field a new weapon system, performance requirements usually override logistics requirements. After all, if the weapon does not perform as required against the threat, there is not much point in developing that weapon system. However, if, due to a lack of support equipment that weapon system is not available to perform its mission, it is just as useless as if it did not meet its performance requirements. And it must be remembered that aircraft today spend more time having logistics functions performed on them than they can spend in the air actually carrying out their mission.

Acquiring support equipment is a microcosm of the entire government acquisition process. Chapter II showed that 70 percent of the life cycle cost of a weapon system was locked in by Milestone 1 and 85 percent by Milestone 2. If supportability does not become a major actor until after Milestone 2, then the supportability problems have already been locked in before the logisticians even approach the stage. Fortunately, a form of Pareto's law is applicable in most instances; 95 percent of the problems are caused by 5 percent of the support equipment. Thus, logisticians are usually able to support the weapon system to a large degree at the time of initial deployment.

Causes of Delay in Support Equipment Acquisition

Research Objective Four. Identify those areas of the support equipment acquisition process that are causing delays in the delivery of support equipment for fielded weapon systems.

Research Questions One. What are the major problem areas in the support equipment acquisition process and what can be done to alleviate them or lessen their impact on support equipment delivery?

Synopsis. With the wide scope of what is called support equipment, it is only natural that no one problem exists. Rationally, it is a series of interlocking problems. Three problems have stood out as being the primary cause of late support equipment delivery throughout this research: 1) instability of the weapon system design; 2) lack of involvement in the early stages of the acquisition process by the logisticians; and, 3) contracting problems and administrative times.

Research Question Three. What additional problem areas of support equipment acquisition exist when dealing with foreign military sales (FMS) programs?

Synopsis. All problems in the DoD acquisition process also exist for the foreign military sales customer. In addition, there are numerous peculiar problems. The four most problematic are: 1) inadequate definitizations; 2) lack of an established support base; 3) increased micromanagement; and 4) configuration management.

Methods to Improve Support Equipment Acquisition Time

Research Objective Five. Determine areas of the support equipment acquisition process that can be improved to reduce acquisition leadtime for the delivery of support equipment for fielded weapon systems.

Research Questions Two. What contracting, procurement, or management strategies exist or could be implemented to assist the logistics manager or acquisition manager reduce leadtime for the delivery of support equipment for fielded weapon systems?

Synopsis. The same four problem areas as discussed in research question one can be used to answer this area. However, several contracting or procurement strategies were discussed in Chapter VII which could help improve support equipment delivery times: 1) multi-year contracts; 2) breakout procurement; 3) locally manufactured non-complex items; and, 4) basic order agreements and provisioned item orders.

Research Question Five. What can be done to alleviate or lessen support equipment acquisition leadtime for foreign military sales (FMS) programs?

Synopsis. If it is assumed that all the other recommendations applying to the DoD have been initiated, the remaining problem area with foreign military sales deliveries is the definitization process.

Additional Areas of Research

The support equipment acquisition process is very dynamic and has begun to receive greater management attention in the last few years. There are many areas of the support equipment acquisition process in need of further study. Some suggested areas are as follows:

1. A detailed study of the weapon system acquisition process, integrated logistics support program, or support equipment acquisition process with emphasis on cost versus time. Justice could not be done for all three in one research project.

2. A study of the definitization process and data item retrieval system for foreign military sales programs.

3. A detailed study of the support equipment recommendation data (SERD) process, with special emphasis on source selection criteria and processing times.

4. Possibly a study such as this one, but from the prime contractor's point of view.

5. A detailed study of standardization and the advantages of nomenclaturing items.

6. A study of Government Furnished Equipment/Local Manufacture problems and alternatives.

7. An analysis of the Minimum Operational Capability concept.

8. An analysis of the stability/instability problem in acquisition of weapon systems.

9. A study of procurement/administrative leadtimes and ways of decreasing same.

10. A study of management techniques as applied to program managers, logistics managers, and acquisition managers.

11. After the merger of Air Force Systems Command and Air Force Logistics Command a study of the acquisition process would be especially beneficial.

Summary

This research paper has attempted to look at the acquisition of support equipment from three different perspectives: 1) from the overall weapon system acquisition process; 2) in the broad perspective of the integrated logistics support (ILS) concept; and, 3) in the much narrower perspective of the procuring organizations.

It is hoped that the need for procurement reform has been shown to the reader, but it must also be realized that reform is easier said than done. From the 1949 Hoover Commission to the 1986 Blue Ribbon Commission on Defense Management and the Goldwater-Nichols DoD Reorganization Act, the same basic recommendations have been proposed, then ignored. The need to professionalize the procurement workforce, streamline regulatory requirements, and restructure the defense acquisition organization have been at the core of dozens of government and private sector reports in the last 45 years. Gordan Adams, a former director of the Defense Budget Project, says,

> It's the old blind-men-and-the-elephant story again. No one can get his hands around the whole thing. People think they have control over it when they never did in the first place. [31:11]

Although this research has attempted to provide several recommendations on how to improve the support equipment acquisition process, it must be understood that these recommendations are for the correction of secondary problems, not the root or core problem. To improve the system at the core of its problem is what Robert B. Costello, former Under Secretary of Defense for Acquisition, proposed in his ten agenda or initiative items designed to improve the acquisition field (10:13):

1. Bolster the defense industrial base;

2. Improve the effectiveness of the acquisition workforce;

3. Improve product quality and reduce the cost of poor quality through total quality management;

4. Forge a new relationship between government and industry;

5. Acquisition regulatory reform;

6. Reduce the leadtime 50 percent for introduction of new technology;

7. Develop a strategy for international technology, acquisition, and logistics programs;

8. Institute a cost estimating process called "could cost," or competition in a sole-source environment;

9. Definitely influence how we manage special access programs;

10. Additionally, always emphasize DoD's commitment to small and small-disadvantaged businesses.

Synaptically, these ten goals and strategies which encompass all program milestones during the acquisition life cycle, are intended to streamline both:

1. The methods by which we conduct business, by bringing them more in line with commercial business practices, while recognizing certain nuances peculiar to defense acquisition; and,

2. The procedures used to increase quality and reliability and reduce weapon systems costs (time and money).

The acquisition and logistical support process for today's weapon systems is becoming extremely more difficult in the face of the rapidly declining Defense dollar. At no time in history has there ever been a more urgent need to reduce support equipment proliferation and increasing costs (both time and dollars) without loss of weapon systems effectiveness. The escalating costs and increasing production leadtimes of support equipment, when coupled with constraints to stay within the Defense budget, should be the concern of every individual responsible for the operational readiness of the weapon systems required for the national security of the United States.

In conclusion, two points must be emphasized. First, though this research was involved mainly with the acquisition of support equipment, it can not be forgotten that the weapon system does have first priority. Support equipment can never supercede prime weapon system requirements. Support equipment is extremely important, but the ultimate goal of the acquisition process is to produce a reliable, affordable, technologically superior weapon system. Second, the best way to improve the support equipment acquisition process is to understand the process as well as possible.

Appendix A: Glossary of Technical Terms

Acquisition Decision Memorandum (ADM). A memorandum signed by the milestone decision authority that documents decisions made and the exit criteria established as the result of a milestone decision review or in-process review (17:435).

Acquisition Plan. A formal written document reflecting the specific actions necessary to execute the approach established in the approved acquisition strategy and guiding contractual implementation. (See Federal Acquisition Regulations Subpart 7.1 and Defense Federal Acquisition Regulations Supplement Subpart 207.1) (17:435).

Acquisition Planning. The process by which the efforts of all personnel responsible for an acquisition are coordinated and integrated through a comprehensive plan for fulfilling the need in a timely manner and at a reasonable cost. It is performed throughout the life cycle and includes developing an overall acquisition strategy for managing the acquisition and a written acquisition plan (17:435).

Acquisition Strategy. A business and technical management approach designed to achieve program objectives within the resource constraints imposed. It is the framework for planning, directing, and managing a program. It provides a master schedule for research, development, test, production, fielding, and other activities essential for program success, and, is the basis for formulating functional plans and strategies (e.g., Test and Evaluation Master Plan, Acquisition Plan, competition, prototyping, etc.) (17:436).

Acquisition Streamlining. Any effort that results in more efficient and effective use of resources to develop or produce quality systems. This includes ensuring that only necessary and cost-effective requirements are included, at the most appropriate time in the acquisition cycle, in solicitations and resulting contracts for the design, development, and production of new systems, or for modifications to existing systems that involve redesign of systems or subsystems (17:436).

Configuration Management. The technical and administrative direction and surveillance actions taken to identify and document the functional and physical characteristics of a configuration item; to control changes to a configuration item and its characteristics; and, to record and report change processing and implementation status (17:437).

Constant Year Dollars. A method of relating dollars in several years by removing the effects of inflation and showing all dollars at the value they would have in a selected base year (17:437).

Defense Acquisition Board (DAB). The senior DoD Acquisition review board chaired by the Under Secretary of Defense (Acquisition). The Vice Chairman, Joint Chiefs of Staff is the Vice-Chair. Other members of the Board are the Deputy Under Secretary of Defense (Acquisition), Service Acquisition Executives of the Army, Navy, and Air Force; the Director, Defense Research and Engineering; the Assistant Secretary of Defense (Program Analysis and Evaluation); the Comptroller of the Department of Defense; the Director, Operational Test and Evaluation, the appropriate Defense Acquisition Board Committee Chair, and the Defense Acquisition Board Executive Secretary. Other persons may attend at the invitation of the Chair, (see DoD Directive 5000.49, "Defense Acquisition Board") (17:438).

Defense Planning and Resources Board (DPRB). A board, chaired by the Deputy Secretary of Defense, established to facilitate decisionmaking during all phases of the planning, programming, and budgeting system process. Board members include the Secretaries of the Military Departments, the Chairman of the Joint Chiefs of Staff, the Under Secretaries of Defense for Acquisition and Policy, the Assistant Secretary of Defense (Program Analysis and Evaluation), and the Comptroller of the Department of Defense (17:438).

Department of Defense Acquisition System. A single uniform system whereby all equipment, facilities, and services are planned, designed, developed, acquired, maintained, and disposed of within the Department of Defense. The system encompasses establishing and enforcing policies and practices that govern acquisitions, to include documenting mission needs and establishing performance goals and baselines; determining and prioritizing resource requirements for acquisition programs; planning and executing acquisition programs; directing and controlling the acquisition review process; developing and assessing logistics implications; contracting; monitoring the execution status of approved programs; and reporting to Congress. (See DoD Directive 5134.1, "Under Secretary of Defense (Acquisition)") (17:438-439).

DoD Components. The Office of the Secretary of Defense; the Military Departments; the Chairman, Joint Chiefs of Staff and Joint Staff; the Unified and Specified Commands; the Defense Agencies; and DoD Field Activities (17:439).

Exit Criteria. Program specific accomplishments that must be satisfactorily demonstrated before an effort or program can progress further in the current acquisition phase or transition to the next acquisition phase. Exit criteria may include such factors as critical test issues, the attainment of projected growth curves and baseline parameters, and the results of risk reduction efforts deemed critical to the decision to proceed further. Exit criteria supplement minimum required accomplishments and are specific to each acquisition phase (17:439-440).

Full Rate Production. Productions of economic quantities followed stabilization of the system design and prove-out of the production process (17:440).

Industrial Base. That part of the total privately owned and Government owned industrial production and depot level equipment and maintenance capacity in the United States and its territories and possessions, as well as capacity located in Canada, that is or shall be made available in an emergency for the manufacture of items required by the U. S. Military Services and selected Allies (17:440).

Integrated Logistics Support. A disciplines, unified, and iterative approach to the management and technical activities necessary to integrate support considerations into system and equipment design; develop support requirements that are related consistently to readiness objectives, to design, and to each other; acquire the required support; and provide the required support during the operational phase at minimum cost (17:441).

Integrated Logistic Support (ILS) Elements (17:441-442):

a. Maintenance Planning. The process conducted to evolve and establish maintenance concepts and requirements for the lifetime of a material system.

b. Manpower and Personnel. The identification and acquisition of military and civilian personnel with the skills and grades required to operate and support a material system over its lifetime at peacetime and wartime rates.

c. Supply Support. All management actions, procedures, and techniques used to determine requirements to acquire, catalog, receive, store, transfer, issue, and dispose of secondary items. This includes provisioning for initial support as well as replenishment supply support.

d. Support Equipment. All equipment (mobile or fixed) required to support the operation and maintenance of a material system. This includes associated multi-use and items, ground-handling and maintenance equipment, tools, meteorology and calibration equipment, test equipment, and automatic test equipment. It includes the acquisition of logistics support for the support and test equipment itself.

e. Technical Data. Recorded information regardless of form or character (such as manuals and drawings) of a scientific or technical nature. Computer programs and related software are NOT technical data; documentation of computer programs and related software are. Also excluded are financial data or other information related to contract administration.

f. Training and Training Support The processes, procedures, techniques, training devices, and equipment used to train civilian and active duty and reserve military personnel to operate and support a material system. This includes individual and crew training; new equipment training; initial, formal, and on-the-job training; and logistic support planning for training equipment and training device acquisitions and installations.

g. Computer Resources Support. The facilities, hardware, software, documentation, manpower, and personnel needed to operate and support embedded computer systems.

h. Facilities. The permanent, or semipermanent, or temporary real property assets required to support the material system, including conducting studies to define types of facilities or facility improvements, locations, space needs, utilities, environmental requirements, real estate requirements, and equipment.

i. Packaging, Handling, Storage, and Transportation. The resources, processes, procedures, design considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly, including environmental considerations, equipment preservation requirements for short-term and long-term storage, and transportability.

j. Design Interface. The relationship of logistics-related design parameters, such as reliability and maintainability, to readiness and support resource requirements. These logistics-related design parameters are expressed in operational terms rather than inherent values and specifically related to system readiness objectives and support costs of the material system.

Integrated Program Assessment (IPA). A document prepared by the supporting staff or review forum of the milestone decision authority to support Milestone I, II, III, and IV reviews. It provides an independent assessment of a program's status and readiness to proceed into the next phase of the acquisition cycle (17:442).

Integrated Program Summary (IPS). A DoD Component document prepared and submitted to the milestone decision authority in support of Milestone I, Ii, III, and IV reviews. It succinctly highlights the status of a program and its readiness to proceed into the next phase of the acquisition cycle (17:442).

Joint Requirements Oversight Council (JROC). A Council, chaired by the Vice Chairman, Joint Chiefs of Staff, that conducts requirements analyses, determines the validity of mission needs and develops recommended joint priorities for those needs it approves, and validates performance objectives and thresholds in support of the Defense Acquisition Board. Council members include the Vice Chiefs of the Army, Navy, and Air Force, and the Assistant Commandant of the Marine Corps. (See MCM-178-90, Charter of the Joint Requirements Oversight Council) (17:443).

Life Cycle Cost. The total cost to the Government of acquisition and ownership of that system over its useful life. It includes the cost of development, acquisition, support and, where applicable, disposal (17:443).

Logistics Supportability. The degree to which planned logistics support (including test, measurement, and diagnostic equipment; spares and repair parts; technical data; support facilities; transportation requirements; training; manpower; and software support) allow meeting system availability and wartime usage requirements (17:443).

Logistics Support Analysis. The selective application of scientific and engineering efforts undertaken during the acquisition process, as part of the systems engineering process, to assist in: causing support considerations to influence design; defining support requirements that are related optimally to design and to each other; acquiring the required support; and providing the required support during the operational phase at minimum cost (17:443).

Maintainability. The ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair (17:443).

Major Program. A term synonymous with "major defense acquisition program" (17:444).

Manufacturing. The process of making an item by hand, or, especially, by machinery, often on a large scale and with division of labor (17:444).

Mission Need. A statement of operational capability required to perform an assigned mission or to correct a deficiency in existing capability to perform the mission (17:444).

Nondevelopmental Item(17:446).

a. Any item of supply that is available in the commercial marketplace;

b. Any previously developed item of supply that is in use by a department or agency of the United States, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

c. Any item of supply described in definition 81.a. orb., above, that requires only minor modification in order to meet the requirements of the procuring agency; or,

d. Any item of supply that is currently being produced that does not meet the requirements of definition 81.a., b., or c., above, solely because the item is not yet in use, or not yet available in the commercial marketplace.

Prime Contractor. A contractor having responsibility for design control and delivery of a system or equipment such as aircraft, engines, ships, tanks, vehicles, guns and missiles, ground communications and electronic systems, ground support equipment, and test equipment (17:447-448).

Program Executive Officers (PEOs). Military or civilian officials who have primary responsibility for directing several acquisition category I programs and for assigned acquisition category II, III, and IV programs. They have no other command or staff responsibilities within their respective Components, and only report to and receive guidance and direction from their DoD Component Acquisition Executive (17:448).

Program Managers (PMs). The single Air Force Manager designated by the implementing command to manage an acquisition program (17:448).

Reliability. The ability of a system and its parts to perform its mission without failure, degradation, or demand on the support system (17:448).

Risk. A subjective assessment made regarding the likelihood or probability of not achieving a specific objective by the time established with the resources provided or requested. It also refers to overall program risk (17:448).

Risk Management. All actions taken to identify, assess, and eliminate or reduce risk to an acceptable level in selected areas (e.g., cost, schedule, technical, producibility, etc.); and the total program (17:448).

Supportability. The degree to which system design characteristics and planned logistics resources, including manpower, meet system peacetime readiness and wartime utilization requirements (17:450).

Technical Data. Scientific or technical information recorded in any form or medium (such as manuals and drawings). Computer programs and related software are not technical data; documentation of computer programs and related software are. Also excluded are financial data or other information related to contract administration (17:450-451).

Weapon System. Items that can be used directly by the armed forces to carry out combat missions and that cost more than $100,000 or for which the eventual total procurement cost is more than $10,000,000. Such term does not include commercial items sold in substantial quantities to the general public. (See Title 10, United States Code, Section 2403, "Major Weapon Systems: (Contractor Guarantees") (17:451).

Appendix B: Glossary of Acronyms

ADM	Acquisition Decision Memorandum
AFLC	Air Force Logistics Command
AFR	Air Force Regulation
AFSC	Air Force Systems Command
AL	Acquisition Logistics
AS	Acquisition Strategy
ATE	Automatic Test Equipment
CFE	Contractor Furnished Equipment
CSE	Common Support Equipment
DAB	Defense Acquisition Board
DID	Data Item Description
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DPML	Deputy Program Manager for Logistics
DSE	Developmental Support Equipment
FMS	Foreign Military Sales
GFE	Government Furnished Equipment
HQ USAF	Headquarters United States Air Force
ICS	Interim Contractor Support
ILS	Integrated Logistics Support
ILSM	Integrated Logistics Support Manager
ILSP	Integrated Logistics Support Plan
IPA	Integrated Program Assessment
IPS	Integrated Program Summary
JROC	Joint Requirements Oversight Council
LCC	Life Cycle Cost
LSA	Logistics Support Analysis
MAP	Military Assistance program
MATE	Modular Automatic Test Equipment
ME	Mission Equipment
MNS	Mission Need Statement
NSN	National Stock Number
ORLA	Optimum Repair Level Analysis
PEO	Program Executive Officer
PM	Program Manager
PMD	Program Management Directive
PMP	Program Management Plan
PMRT	Program Management Responsibility Transfer
PPBS	Programming, Planning, and Budgeting System
PSE	Peculiar Support Equipment
RDT&E	Research, Development, Test, and Evaluation
RFP	Request for Proposal
RFP	Request for Price
SE	Support Equipment
SECDEF	Secretary of Defense
SEP	Support Equipment Plan
SERD	Support Equipment Recommendation Data
SERL	Support Equipment Requirements List
SPO	System Program Office
SSA	Source Selection Authority

SSB	Source Selection Board
STE	Special Test Equipment
TA	Table of Allowance
TEMP	Test and Evaluation Master Plan
TO	Technical Order
TSTE	Temporary Special Test Equipment
USDA	Under Secretary of Defense for Acquisition

Appendix C: Milestone Data Review

(As outlined in DoDI 5000.2)

MILESTONE 0 - CONCEPT STUDIES APPROVAL

OBJECTIVES

The objectives of Milestone 0 are to:

Determine if a documented mission need warrants the initiation study efforts of alternative concepts and

Identify the minimum set of alternative concepts to be studied to satisfy the need.

DECISION CRITERIA

Studies of alternative concepts and entry into Phase 0 may not be approved unless the milestone decision authority determines that the mission need:

Is based on a validated projected threat (see Section 4-A).

Cannot be satisfied by a nonmaterial solution, and

Is sufficiently important to warrant the funding of study efforts to explore and define alternative concepts to satisfying the need.

ACQUISITION DECISION MEMORANDUM

The Acquisition Decision Memorandum for this decision point should:

Define the minimum set of alternative concepts to be examined,

Identify the lead organization or organizations for the study efforts,

Establish any exit criteria information or analyses that must be presented at Milestone I, and

Identify the dollar amount and source of funding for the study efforts to be conducted.

PHASE 0 - CONCEPT EXPLORATION & DEFINITION

OBJECTIVES

The objectives of Phase 0 are to:

Explore various material alternatives to satisfying the documented mission need,

Define the most promising system concept(s),

Develop supporting analyses and information to include identifying high risk areas and risk management approaches to support the Milestone I decision, and

Develop a proposed acquisition strategy and initial program objectives for cost, schedule, and performance for the most promising system concept(s).

MINIMUM REQUIRED ACCOMPLISHMENTS

The following are minimum required accomplishments for this phase:

A validated system threat assessment (see Section 4-A),

Assessments of the major pros and cons of each alternative given the projected threat (see Section 4-E),

A proposed acquisition strategy (see Section 5-A) for the most promising alternative(s) that addresses:

> Key system characteristics and operational constraints (see Sections 4-B and 4-C),
>
> Cost, schedule, and performance trade-off opportunities,
>
> Proposed objectives for cost, schedule, and performance (see Section 11-A), and
>
> The risks associated with the concept(s) and risk management approach (see Sections 5-A and 5-B),

Identification of potential environmental consequences (42 U.S.C. 4321-4347 (reference (b))), and

Proposed program-specific exit criteria that must be accomplished during Phase I, Demonstration and Validation.

MILESTONE 1 - CONCEPT DEMONSTRATION APPROVAL

OBJECTIVES

The objectives of Milestone I are to:

Determine if the results of Phase 0 warrant establishing a new acquisition program and

Establish a Concept Baseline containing initial program cost, schedule, and performance objectives for an approved new program (see Section 11-A).

DECISION CRITERIA

A new program may not be established unless the milestone decision authority confirms that:

The system threat assessment and the performance objectives and thresholds have been validated (see Section 4-A and 11-B,

The study efforts conducted support the need for a new program,

The potential environmental consequences of the most promising alternative have been analyzed and appropriate mitigation measures have been identified (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))),

Projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Sections 4-D and 10-A), and

Adequate resources (people and funds) to support the program are, or can be, programmed.

NOTE: The order of preference for new programs is prescribed in DoD Directive 5000.1 (reference (a)) as:

Use or modification of an existing U.S. military system,

Use or modification of an existing commercially developed or Allied system that fosters a nondevelopmental acquisition strategy,

A cooperative research and development program with one or more Allied nations,
A new joint Service development program,

A new Service-unique development program.

ACQUISITION DECISION MEMORANDUM

The Acquisition Decision Memorandum for this decision point should:

Approve the initiation of a new program and entry into Phase I, Demonstration and Validation,

Approve the proposed or modified acquisition strategy and Concept Baseline,

Establish program-specific exit criteria that must be accomplished during Phase I, and

Identify affordability constraints derived from the planning, programming, and budgeting system.

PHASE 1 - DEMONSTRATION & VALIDATION

OBJECTIVES

The objectives of Phase I are to:

Better define the critical design characteristics and expected capabilities of the system concept(s),

Demonstrate that the technologies critical to the most promising system concept(s) can be incorporated into system design(s) with confidence,

Prove that the processes critical to the most promising system concept(s) are understood and attainable,

Develop the analyses/information needed to support a Milestone II decision, and

Establish a proposed Development Baseline containing refined program cost, schedule, and performance objectives for the most promising design approach (see Sections 4-B and 11-A).

MINIMUM REQUIRED ACCOMPLISHMENTS

The following are minimum required accomplishments for this phase:

A validated system threat assessment (see Section 4-A),

Identification of major cost, schedule, and performance trade-off opportunities,

A development Baseline which includes proposed cost, schedule, and performance objectives (see Section 11-A), Developmental test results that indicate the degree to which new or emerging technologies pose a risk to the program,

A refined acquisition strategy (see (Section 5-A) that identifies:

High risk areas and the risk management approach for these areas (see Section 5-B) and

Low-rate initial production quantities, if appropriate.

An assessment of the defense industrial base capability to support the program (DFARS, Part 207, Subpart 207.1 (reference (i))),

Identification of potential environmental consequences and identification of appropriate mitigation measures (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))),

An updated assessment that shows projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Sections 4-D and 10-1),

Programming of adequate resources to support the proposed program, and

Proposed program-specific exit criteria that must be accomplished during Phase II, Engineering and Manufacturing Development.

MILESTONE II - DEVELOPMENT APPROVAL

OBJECTIVES

The objectives of Milestone II are to:

Determine if the results of Phase I, Demonstration and Validation, warrant continuation and

Establish a Development Baseline containing refined program cost, schedule, and performance objectives for a program approved for continuation (see Sections 4-B and 11-A).

DECISION CRITERIA

A program may not enter Phase II, Engineering and Manufacturing Development, unless the milestone decision authority confirms that:

The system threat assessment and the performance objectives and thresholds have been validated (see Sections 4-A and

11-B), Prototyping and demonstration results to date provide reasonable assurance that the technologies and processes critical to success are attainable (see Sections 5-C and 5-D),

The potential environmental consequences of the program have been analyzed and appropriate mitigation measures have been identified (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))),

Projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Section 4-D and 10-A), and

Adequate resources (people and funds) to support the program have been, or are committed to be, programmed.

ACQUISITION DECISION MEMORANDUM

The Acquisition Decision memorandum for this decision point should:

Approve entry into Phase II, Engineering and Manufacturing Development

Approve the proposed or modified acquisition strategy and Development Baseline,

Establish program-specific exit criteria that must be accomplished during Phase II, and

Identify low-rate initial production quantities, if appropriate.

PHASE II - ENGINEERING AND MANUFACTURING DEVELOPMENT

OBJECTIVES

The objectives of Phase II are to:

Translate the most promising design approach developed in Phase I, Demonstration and Validation, into a stable, producible and cost effective system design,

Validate the manufacturing or production process, and

Demonstrate through testing that the system capabilities:

Meet contract specification requirements, and

Satisfy the mission need and meet minimum acceptable operational performance requirements (see Section 4-B)

MINIMUM REQUIRED ACCOMPLISHMENTS

The following are minimum required accomplishments for this phase:

A validated system threat assessment (see Section 4-A),

Test results that provide a realistic portrait of performance under operational conditions,

Low-rate initial production experience that:

Verifies the adequacy of the manufacturing or production process,

Confirms the stability and producibility of the design, and

Provides a realistic estimate of production costs,

A refined acquisition strategy and system cost estimate (see Sections 5-A and 10-A),

A Production Baseline that includes refined program cost, schedule, and performance objectives (see Sections 4-B and 11-A),

A system configuration baseline (see Section 9-A),

Identification of potential environmental consequences and development of appropriate mitigation measures (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))). An updated assessment that shows projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Sections 4-D and 10-A), and

Programming of adequate resources to support production, deployment, and support.

MILESTONE III - PRODUCTION APPROVAL

OBJECTIVES

The objectives of Milestone III are to:

Determine if the results of Phase II, Engineering and Manufacturing Development warrant continuation and

Establish a Production Baseline containing refined program cost, schedule, and performance objectives for a program approved for continuation (see Sections 4-B and 11-A).

DECISION CRITERIA

A program may not enter full rate production (or construction in the case of ships and satellites) unless the milestone decision authority confirms that:

The system threat assessment and the performance objectives and thresholds have been validated (see Section 4-A and 11-B),

Test results and low-rate initial production provide reasonable assurance that the design is:

Stable, operationally acceptable, logistically supportable, and

Capable of being produced efficiently,

The potential environmental consequences of the program have been analyzed and appropriate mitigation measures have been developed (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))),

Projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Section 4-D and 10-A), and

Adequate resources (people and funds) to support production, deployment, and support have been programmed.

ACQUISITION DECISION MEMORANDUM

The Acquisition Decision Memorandum for this decision point should:

Approve entry into Phase III, Production and Deployment,

Approve the proposed or modified acquisition strategy and Production Baseline, and

Establish program-specific exit criteria that must be accomplished during Phase III, if appropriate.

PHASE III - PRODUCTION AND DEPLOYMENT

OBJECTIVES

The objectives of Phase III are to:

Establish a stable, efficient production and support base,

Achieve an operational capability that satisfies the mission need, and

Conduct follow-on operational and production verification testing to confirm and monitor performance and quality.

MINIMUM REQUIRED ACCOMPLISHMENTS

The following are minimum required accomplishments for this phase:

Updated configuration baseline(s) (see Section 9-A),

Updated and validated system threat assessment(s),

Refined cost information,

Execution of operational and support plans to include transition from contractor to in-house support, if appropriate, and

Identification of operational and/or support problems.

MILESTONE IV - MAJOR MODIFICATION APPROVAL

OBJECTIVES

The objectives of Milestone IV are to:

Determine if major upgrades to a system currently in production are warranted and, for a system where such action is warranted,

Establish an approved acquisition strategy and baseline. Concept, Development, or Production) for the program (see Sections 5-A and 11-A).

NOTE: This Milestone is schedule as required during Phase III, Production and Deployment.

When a system is no longer in production, a deficiency resulting from a change in threat, defense policy, or technology must be defined in a new Mission Need Statement.

The intent is that potential system modifications should compete with all other possible alternatives during a new Phase 0, Concept Exploration and Definition.

DECISION CRITERIA

A new major upgrade or modification program may not be established unless the milestone decision authority confirms that:

The system threat assessment and the performance objectives and thresholds have been validated (see Sections 4-A and 11-B),

Field experience and results support the need for such a program.

Reasonable assurance exists that the technologies and processes critical to success have been identified and are attainable in the context of the acquisition strategy and phase being proposed,

The potential environmental consequences of the program have been analyzed and appropriate mitigation measures have been developed (42 U.S.C. 4321-4347 and 40 C.F.R. 1500-1508 (references (b) and (m))),

Projected life cycle costs and annual funding requirements are affordable in the context of long range investment plans or similar plans (see Section 4-D and 10-A), and

Adequate resources (people and funds) to support the program have been, or are committed to the program.

ACQUISITION DECISION MEMORANDUM

The Acquisition Decision Memorandum for this decision point should:

Define the phase of the process the program is approved to enter,

Approve the proposed or modified acquisition strategy and baseline (Concept, Development, Production) (see Section 11-A), and

Establish program-specific exit criteria that must be accomplished.

PHASE IV - OPERATIONS AND SUPPORT

OBJECTIVES

The objectives of Phase IV are to:

Ensure the fielded system continues to provide the capabilities required to meet the identified mission need and

Identify shortcomings or deficiencies that must be corrected to improve performance.

MINIMUM REQUIRED ACCOMPLISHMENTS

The following are minimum required accomplishments for this phase:

Updated configuration baseline(s) (see Section 9-A),

Updated and validated system threat assessment(s),

Attainment and maintenance of required performance characteristics and capabilities, and

Conduct of service life extension programs, as appropriate.

APPENDIX D: Command Responsibility

This appendix reproduced in part from AFR 800-12, dated 13 December, 1985, pages 5 through 7.

SUPPORT EQUIPMENT ACQUISITION - COMMAND RESPONSIBILITY

HQ USAF RESPONSIBILITIES:

a. Formulates, establishes, and maintains Air Force policy on all aspects of the SE selection process.

b. Develops and publishes policies and procedures for SE development, acquisition and support.

c. Provides Air Staff surveillance of SE acquisition and management practices.

d. Monitors the acquisition of SE through program management reviews and report, PMPs, configuration management plans, logistics support plans, and logistics readiness reviews.

e. Monitors and defends funding for common SE design requirements to the Air Force Board and OSD.

IMPLEMENTING COMMAND RESPONSIBILITIES:

Even though AFSC is usually the implementing command, other Air Force agencies such as AFLC, AFCC, and ESC also acquire SE for the Air Force and other DOD agencies.

a. Prescribes, monitors, reviews, and provides guidance on SE acquisition for each program and project according to the policies stated in this regulation.

b. Coordinates the SE identification, selection, acquisition, configuration, and developmental test and evaluation (DT&E) for specific SE with the supporting and operating commands.

c. Provides forecasts of common SE funding requirements to the supporting command.

d. Includes SE costing in cost estimates.

e. Includes SE planning in the PMP.

f. Coordinates with the supporting and using commands to determine the most cost-effective quantities, location, mixes, and need dates.

g. Ensures the interface compatibility of SE with each item of prime mission equipment that it supports. In the case of fault isolation or verification equipment, ensures the interface compatibility and consistency of fault-indication results between and among equipment used at each maintenance level.

h. Ensures that statements of work contain a requirement for contractors to review SE data bases such as MIL-HDBK-300, GSA Supply Catalog, and SA-ALC ATE Management Report, before issuing LSAR E-sheets or SERDs. Justification stating why existing SE was not used must accompany recommendations for new SE.

i. Ensures that requests for proposals and contracts contain the requirement for the contractor to prepare a CMRS.

j. Implements the portable automatic test equipment calibration (PATEC) transportable field calibration unit (TFCU), or electronics standard set (ESS) concept as part of the effort to develop and acquire system SE as identified in the approved CMRS. Includes funding for contractor-developed calibration test program sets (TPS) for ATE using PATEC.

k. Funds for peculiar standards research and development projects and unique standards resulting therefrom.

l. Funds and purchases special standards as identified and approved by the Aerospace Guidance and Metrology Center (AGMC).

m. Coordinates with participating using commands to conduct operational testing.

n. Ensures adequate DT&E, OT&E and TO validation and verification efforts are planned and accomplished for SE.

o. Ensures SE support is planned, programmed, and delivered with SE for which it is responsible (see AFR 800-8).

SUPPORTING COMMAND RESPONSIBILITIES:

a. Prescribes, monitors, reviews, and provides guidance on management of SE under its cognizance according to the policies stated in this regulation.

b. Supports the implementing command in SE identification and selection.

c. Coordinates with the implementing and using commands, and assumes specific responsibility for determining the most cost-effective quantities, locations, mixes, and need dates for SE.

d. Includes the evaluation of SE suitability and compatibility as part of the ongoing OT&E.

e. Establishes and maintains an integrated system for maintaining calibration support and measurement traceability.

f. Actively assists the implementing command and makes technical inputs, when requested, in the PMP.

g. Initiates provisioning support for the common SE and the SE for SE.

h. Reviews system operational and maintenance concepts, and assists in determining the source of calibration support to satisfy these concepts.

i. Assists in identifying PATEC, TFCU, or ESS requirements by reviewing system data.

j. Projects budgetary requirements for system PATEC requirements that are common, or for common TFCU, or ESS equipment.

k. Assembles system augmentation package for PATEC or ESS, and delivers to precision measurement equipment laboratories supporting system ATE.

l. Ensures precision measurement equipment laboratories have the necessary capability to provide calibration support of the PATEC, TFCU, and ESS.

m. Ensures support for SE is delivered for SE for which it is responsible (see AFR 800-8).

PARTICIPATING AND USING COMMAND RESPONSIBILITIES:

a. Prepare procedures to implement the policies set forth in this regulation. These procedures must be compatible with the procedures of the implementing and supporting commands.

b. Support the implementing and supporting commands in the SE planning and acquisition management process, starting with conceptual phase studies through production and delivery of the system and the SE.

c. Specify SE requirements based on system and subsystem deployment and mission codes.

d. Estimate prospective SE operational effectiveness and suitability and identify any operational deficiencies and the need for modifications in accordance with AFR 80-14.

e. Evaluate selected LSAR E-sheets or SERDs and proposed SE for suitability as requested by the acquisition agency.

f. Review and evaluate proposed SE requirements for need.

g. Review and evaluate SETOs.

h. Create the system and subsystem maintenance concept with the assistance of the implementing and supporting commands. Aid in preparing the maintenance plan, and make updates to the plan when operational considerations affect the maintenance concept (see AFR 66-14).

i. Actively assist the implementing and supporting commands, and make technical and operational inputs, when requested, in the PMP.

j. Address calibration support requirements when formulating the system operation and maintenance concept.

k. Advise the acquisition agency and supporting command of locations where PATEC, TFCU, and ESS support are required.

l. Screen Air Force Standard/Preferred Item List (AF S/PIL) and market surveys for selection of Government-Furnished Equipment (GFE) or Contractor-Furnished Equipment (CFE). Make inputs relative to technical and operational suitability of SE candidates, and recommend items for selection. Recommend equipment to update government data banks or other data-retrieval systems in use.

m. Manage and distribute maintenance records of built-in-test (BIT) SE operational failures. Recommend replacing or modifying equipment when it is unsuitable or unreliable for mission requirements.

n. Identify SE training requirements.

o. Actively support the AGSEWG in its efforts to improve SE acquisition.

p. Conduct OT&E according to AFR 80-14.

APPENDIX E: Pre-SERD Review Criteria

This appendix reproduced in part from AFR 800-12, supplement 1, dated 18 July, 1986, pages 1 through 2.

The pre-SERD review normally includes representatives from the program office, the using command, involved AFLC ALC's, Air Force Operational Test and Evaluation Center (when involve), and the Air Force plant representative office or Defense Contract Administration Service. Normally, the pre-SERD review is an LSAR team effort and involves a review of SE identified on the LSAR E- sheets and SE recommended on the Standard/Modified Hand Tools List.

1. Representatives at the pre-SERD review must--

   a. Examine the validity of the proposed SE requirement.

   b. Determine the technical adequacy of the proposed SE for doing the job.

   c. Establish the reasonableness of the proposed estimated SE price by considering the intrinsic value of the items and comparing the proposed SE to similar SE in use.

   d. Challenge the proposed SE if it appears to be too expensive or more complex than its function requires. For each recommended SE item requiring development, refer to all SE items currently available or under development that may be adequate or that could be modified at a lesser expense to be functionally adequate for the intended use.

   e. Determine whether noncomplex SE (such as hand tools, maintenance aids, and holding fixtures) can be acquired cost-effectively through local manufacture or local purpose.

   f. Reject SERDs used to identify items that are not permitted, under paragraphs 6b(3) and 10c, to be identified by the SERD process.

   g. Validate quantity of items and basis of issue (BOI).

   h. For noncomplex SE and hand tools, make sure specifications are tailored to reduce normal SERD requirements.

   i. Identify administrative and clerical corrections.

j. Determine those SERDs requiring emergency processing due to criticality or need date and determine processing requirements.

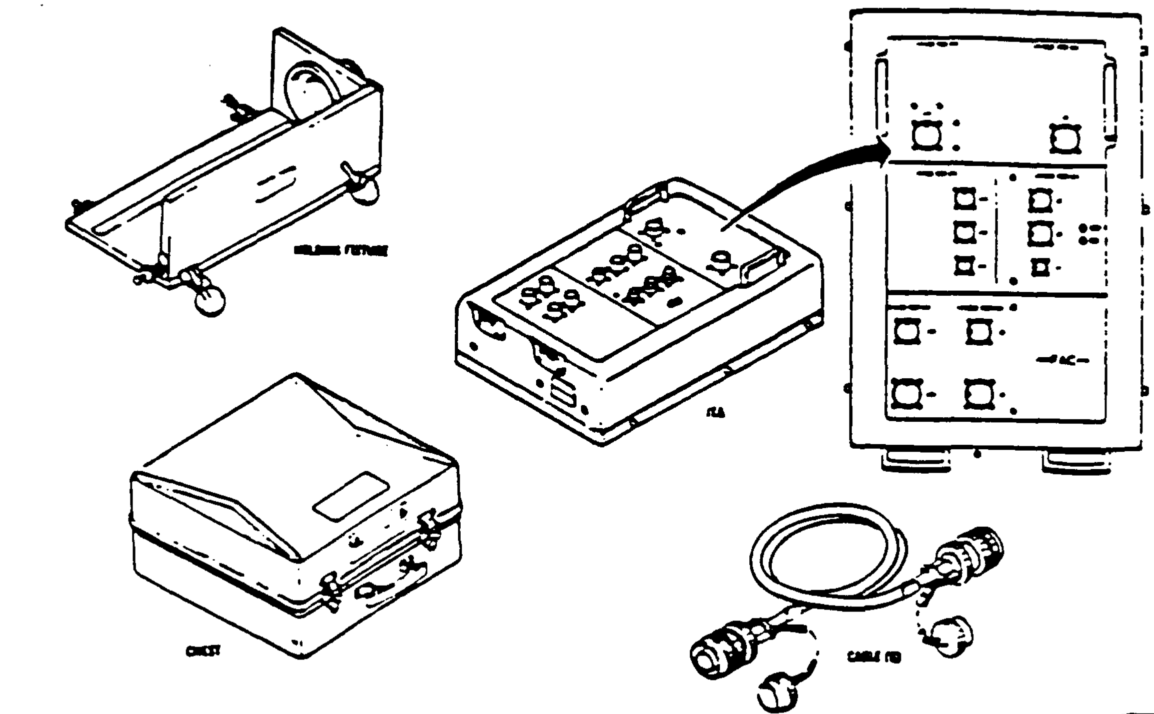
k. Review requirements for TOs and commercial manuals.

l. Evaluate the safety of the proposed SE for the intended operational environment.

2. Results of the pre-SERD review will be documented in system program office (SPO) files and authenticated by the program or program manager. Items given preliminary approval at the pre- SERD review should be submitted, after incorporation of recommended actions, through the formal SERD process for final evaluation and SPO approval.

GENERAL DYNAMICS
Fort Worth Division

INTERFACE TEST ADAPTER-F-16 AVIONICS COMPUTER



ISSUE
7

F-16 APPLICATION

ITAs are utilized to interface the ATE with Line Replaceable Units (LRUs) to be tested. The avionics computer ITA is used to interface the computer/inertial test station with the General Avionics Computer (GAC). The GAC is a programmable digital computer which must be configured/-programmed to perform its operational function and assigned tasks by loading its battery backed-up RAM memory with Operational Flight Program (OFP) intelligence after functional checkout. Testing of the GAC isolates faults to the central processing unit, memory module, input/output controller, serial data interface and power supply. The ITA consists of a Patch Panel which mates to the Interface Panel on the AIS Computer/Inertial Test Station, a holding fixture, and necessary cables to connect to the LRUs to the Patch Panel.

Associate Equipment

SERD 90746   Advanced Computer C/I Test Station

PHYSICAL DESCRIPTION	FACILITY/POWER REQMTS	APPLICABLE TECHNICAL MANUALS
SIZE: 20"L x 10"H x 12"W 51.3cmL x 25.6cmH x 30.7cmW WEIGHT: 99 pounds 44.9 kg	No facility power required	Usage: 33D7 ɔ3-1362-1

USAF LEVELS OF USE	BASIS OF ISSUE	ITEM MANAGER	SOURCE
INTERMEDIATE	2/72	OO-ALC	CTE

MANUFACTURER	MFG PART NO.	NAT'L STOCK NO.	F-16 SERD NO.
General Dynamics Fort Worth Division Fort Worth, Texas	16U374314-1 (F-16C/D Blk 40 & on)	4920-01-250-8707WF	74314

GENERAL DYNAMICS Fort Worth Division	DOCUMENT NO. 16PR011 CONTRACTOR General Dynamics CONTRACT NO. F33657-82-C-2038 END ARTICLE IDENT F-16C/D FIG 1 PAGE NO. 1
SUPPORT EQUIPMENT RECOMMENDATION DATA (SERD)	REVISION NO. ORIG DATE 30 October 1986

PART I FUNCTIONAL ANALYSIS

The F-16 Avionics Intermediate Shop (AIS) comprises Automatic Test Equipment (ATE), Accessory Equipment, Software and Interface Test Adapters (ITAs). ITAs are utilized to interface the ATE with Line Replaceable Units (LRUs) to be tested. Each ITA consists of (1) a single Interface Test Adapter Panel which mates with the ATE Patch Panel Interface and (2) one or more Interface Test Adapter Cable Assemblies which provide the necessary cables, fixtures, etc. to complete the ATE/LRU interface arrangement illustrated in Figure 1 through Figure 3.

It has been determined by engineering analysis that a specially designed ITA utilized in conjunction with the Computer/Inertial Test Station is required to provide Intermediate Level support as described herein for the F-16 General Avionics Computer (GAC) P/N 16VE325001-1.

(Continued on Page 5)

PART II RECOMMENDED SOLUTION

There is no existing item of equipment that can satisfy the requirements specified in Part I. It is therefore recommended that a specially designed item be developed and designated Interface Test Adapter - F-16 Avionics Computers (FAC), General Dynamics P/N 16U374314-1. The recommended ITA with accompanying software will be comprised of the following:

A. Technical

The ITA will consist of a Patch Panel which will mate to the Interface Panel on the AIS Computer/Inertial Test Station, a holding fixture, and necessary cables to connect to the LRUs to the Patch Panel.

*P/N to be established at PCA.

(Continued on Page 8)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

GENERAL DYNAMICS

FORT WORTH DIVISION

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR GENERAL DYNAMICS
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16 C/D
FIGURE 1 PAGE NO. 2
REVISION NO. ORIG
DATE 30 October 1986

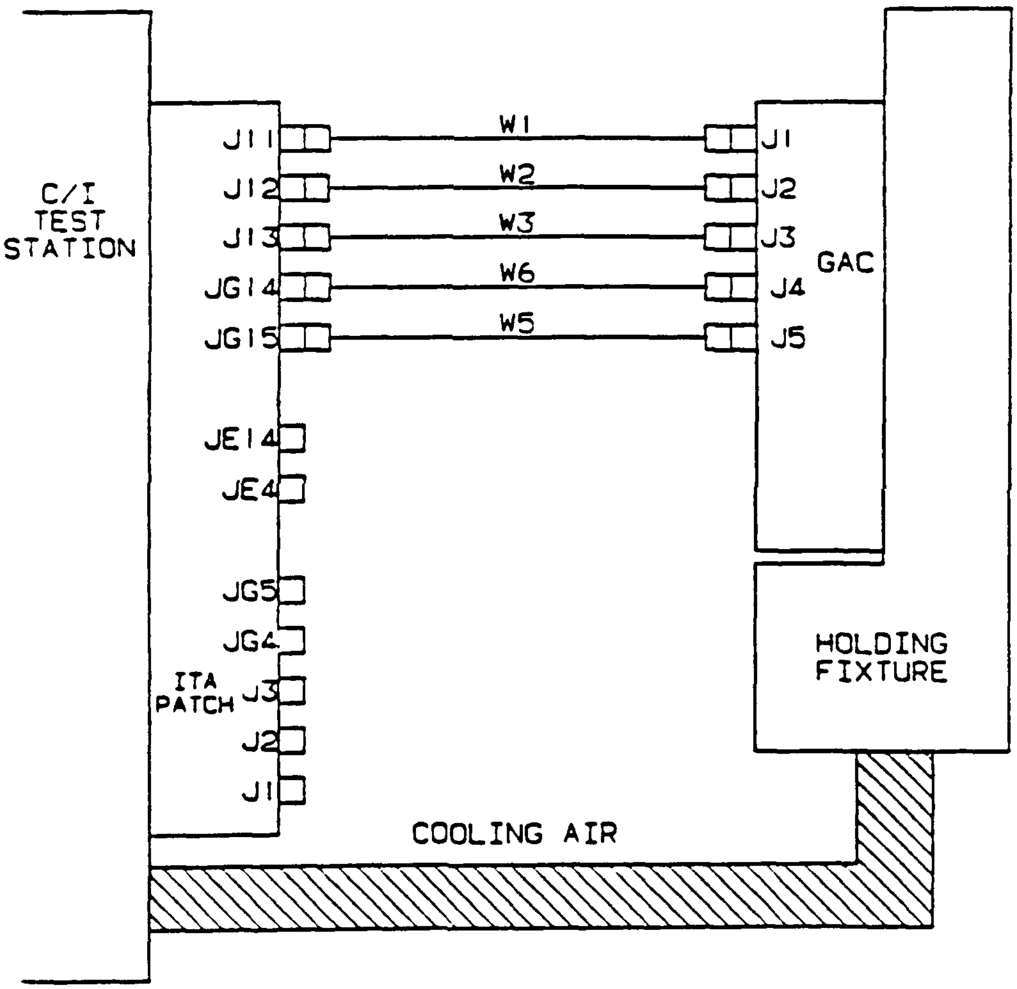


FIGURE 1. ATE-ITA-LRU INTERFACE (GAC)

ITEM NO.	ITEM NAME
74314	INTERFACE TEST ADAPTER, F-16 AVIONICS COMPUTERS (CCP 9227R1)

FWP 4774-4-75

GENERAL DYNAMICS

FORT WORTH DIVISION

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR GENERAL DYNAMICS
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16 C/D
FIGURE 1 PAGE NO. 3
REVISION NO. ORIG
DATE 30 October 1986

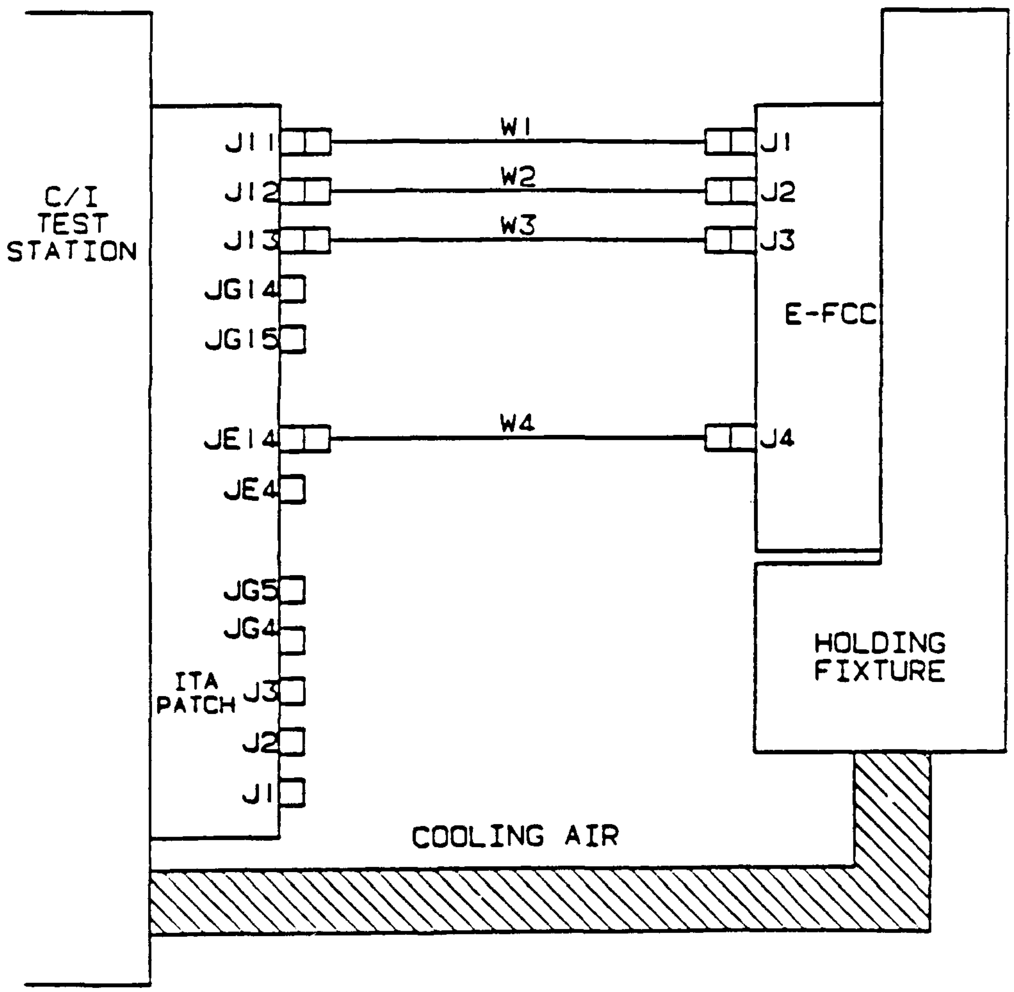


FIGURE 2. ATE-ITA-LRU INTERFACE (E-FCC)

ITEM NO.	ITEM NAME
74314	INTERFACE TEST ADAPTER, F-16 AVIONICS COMPUTERS (CCP 9227R1)

FWP 4774-4-75

GENERAL DYNAMICS
FORT WORTH DIVISION

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO.	16PR011
CONTRACTOR	GENERAL DYNAMICS
CONTRACT NO.	F33657-82-C-2038
END ARTICLE IDENT	F-16 C/D
FIGURE 1 PAGE NO.	4
REVISION NO.	ORIG
DATE	30 October 1986

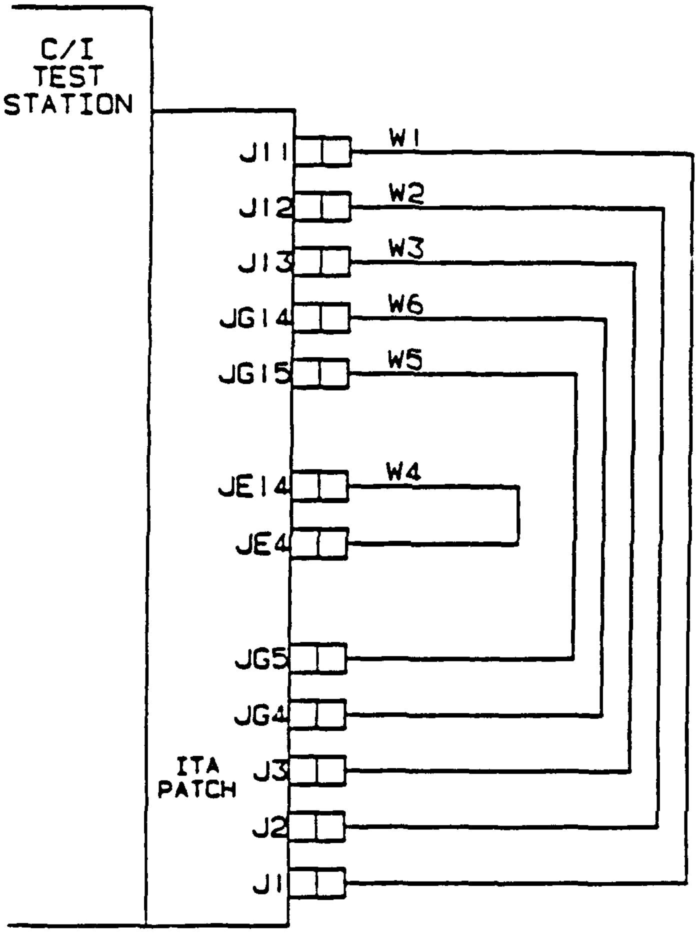


FIGURE 3. ATE-ITA SELF-TEST INTERFACE

ITEM NO.	ITEM NAME
74314	INTERFACE TEST ADAPTER, F-16 AVIONICS COMPUTERS (CCP 9227R1)

FWP 4774-4-75

GENERAL DYNAMICS Fort Worth Division	**DOCUMENT NO.** 16PR011 **CONTRACTOR** General Dynamics **CONTRACT NO.** F33657-82-C-2038 **END ARTICLE IDENT** F-16C/D **FIG 1 PAGE NO.** 5
SUPPORT EQUIPMENT **RECOMMENDATION DATA (SERD)**	**REVISION NO.** ORIG **DATE** 30 October 1986

PART I FUNCTIONAL ANALYSIS (CONT'D)

It has also been determined by engineering analysis that the Enhanced Fire Control Computer (E-FCC) P/N 7565700-041) has a similar system interface to the GAC. One ITA that tests the GAC and the E-FCC would alleviate the need for two separate ITAs for these LRUs in the Block 40 shop.

For more information concerning maintenance and test requirements for the E-FCC refer to SERD 74708.

GAC Maintenance Concept. The GAC requires performance and diagnostic testing at the intermediate level of maintenance in accordance with an assigned SMR code of PAODD. Testing of the LRU will be accomplished in the AIS on the Computer/Inertial Test Station in conjunction with an Interface Test Adapter and test software prepared in accordance with System Test Specification 16STS74CEO-1.

Intermediate level testing of the GAC shall accomplish isolating faults to the following shop replaceable units (SRUs):

1. Central Processing Unit (CPU)

2. Memory Module

3. Input/Output Controller (IOC)

4. Serial Data Interface (SDI)

5. Power Supply

The test software will also be able to fault isolate to each of the two batteries.

(Continued on Page 6)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

GENERAL DYNAMICS
Fort Worth Division

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16C/D
FIG 1 PAGE NO. 6
REVISION NO. ORIG
DATE 30 October 1986

PART I FUNCTIONAL ANALYSIS (Cont'd)

In addition to the LRU test programs, an ITA computer test software program is required for functional checkout of the ITA utilizing the Computer/Inertial Test Station.

The predicted Mean Flight Time Between Failure (MFTBF) for the GAC is 495 hours (with batteries) or 575 hours (without batteries).

GAC Test Requirements. Detailed GAC performance and diagnostic test requirements are defined by 16STS74CE0-1. These requirements are summarized below:

Cooling Requirements:	2 Lbs/min at 72 Degrees F Max
Power Inputs:	115V, 400 Hz, 130 Watts Max 28 VDC Power On, 5 Watts Max
Stimuli (System Connectors):	
Synchro	two 3-wire Synchro inputs as defined in 16PP967
DC Analog	six ± 10 volt (2 single, 4 pairs) as defined in 16PP967
High Level DC Discrete	thirty-six 28 volt single ended discretes as defined in 16PP967
DC Differential	sixteen 5 volt differential as defined in 16PP967
Serial Address	five gnd/open serial terminal address
Serial	four redundant serial channels in accordance with MIL-STD-1553 and MIL-STD-1553B

(Continued on Page 7)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

GENERAL DYNAMICS
Fort Worth Division

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16C/D
FIG 1 PAGE NO. 7
REVISION NO. ORIG
DATE 30 October 1986

PART I FUNCTIONAL ANALYSIS (Cont'd)

1 open/gnd	zeroize signal for memory
Stimuli (AGE Connector):	Differential Serial interface to implement DMA operations, CPU control, and I/O operations

Measurement Requirements (System Connectors):

DC Differential	sixteen 5 volt differential as defined in 16PP303
Serial	four redundant serial channels in accordance with MIL-STD-1553 and MIL-STD-1553B

Measurement Requirements (AGE Connector):

Differential Serial interface to perform DMA operations, register reads, and I/O transfers

Various test points for LRU fault isolation capability

The GAC is a programmable digital computer which must be configured/-programmed to perform its operational function and assigned tasks by loading its battery backed-up RAM memory with Operational Flight Program (OFP) intelligence after functional checkout. A requirement, therefore, exists to load and verify the GAC OFP at its base of operation.

The Interface Test Adapter provided for support of the LRUs listed must inlude:

(Continued on Page 8)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

GENERAL DYNAMICS
Fort Worth Division

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16C/D
FIG 1 PAGE NO. 8
REVISION NO. ORIG
DATE 30 October 1986

PART I FUNCTIONAL ANALYSIS (Cont'd)

- o Hardware sufficient to accommodate the maintenance concept and test requirements when testing the GAC on the Computer/Inertial Test Station.
- o A test software computer program which implements the scope of testing imposed by the referenced system test specification.
- o A test software computer program which allows verification of proper operation and fault location within the ITA (to replaceable SRUs) via 'wrap around testing' in conjunction with the Computer/Inertial Test Station.
- o Built in identification features which allow the test software to verify that the correct ITA is connected for an LRU test.

PART II RECOMMENDED SOLUTION (Cont'd)

Provisions to attain wrap-around testing as self test, will be made.

All electrical components used to assure proper input/output signal communication between the LRUs and the Computer/Inertial Test Station shall be included in the ITA.

In addition to the hardware described above, the FAC ITA will include and/or conform to the following:

- o The ITA Panel, Cable Assemblies and related hardware design, construction and self test shall be in accordance with 16PS003 as amended by Appendix I.
- o The weight of the ITA Panel less any interconnecting cables will not exceed 45 lbs.
- o Dimensions of the ITA Panel shall not exceed 18" x 28" x 7".

(Continued on Page 9)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

PART II RECOMMENDED SOLUTION (Cont'd)

- o The ITA design will incorporate identification features that allow the test software to check that the correct ITA is connected.

- o The ITA will be designed to minimize active components but active components will be incorporated as necessary to provide the required ATE/LRU interface.

- o LRU test software programs will be developed consisting of the performance and diagnostic tests necessary to implement the maintenance concepts and test requirements described in Part I for the GAC.

- o LRU test software for the E-FCC will be modified as necessary for re-hosting to the new FAC ITA.

The tests will be written in the F-16 ATLAS Language documented in ATLAS Language Specification and Programming Manual, 16PP231.

- o A test software program will be developed for the ITA in accordance with 16STS74314-1. ITA self test will be performed with the ITA panel, Cable Assemblies, related hardware and necessary accessory equipment properly connected to the C/I test station for wrap around testing.

- o LRU test programs will be documented and submitted to the Government in accordance with F-16 CDRL.

- o The extent to which module extractors are required to implement the maintenance concepts imposed on this ITA will be established. These requirements will be submitted as a separate SERD.

(Continued on Page 10)

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

GENERAL DYNAMICS
Fort Worth Division

SUPPORT EQUIPMENT
RECOMMENDATION DATA (SERD)

DOCUMENT NO. 16PR011
CONTRACTOR General Dynamics
CONTRACT NO. F33657-82-C-2038
END ARTICLE IDENT F-16C/D
FIG 1 PAGE NO. 10
REVISION NO. ORIG
DATE 30 October 1986

PART II RECOMMENDED SOLUTION (Cont'd)

B. Applicable Design Specification

The ITA panel, cable assemblies, and related hardware design construction and self test shall be in accordance with 16PS003 as ammended by Appendix I.

C. Applicable Tests

Engineering Evaluation Testing will be conducted using the before mentioned LRUs, ITA, LRU test programs and ITA self test program utilizing the C/I test station to assure overall compatibility. This testing, including the formal system compatibility demonstration will be in accordance with the F-16 AIS Plan (16PP1404). The system compatibility demonstration will be the means of establishing that the ITA, the C/I test station, and test programs satisfy the requirements of the GAC STS 16STS74CE0-1, E-FCC STS 16STS74CC0-1, and the FAC ITA STS 16STS74314-1.

D. Associated Equipment

SERD	NOMENCLATURE
90746	Advanced Computer C/I Test Station

E. Container Requirement

A rigid container is required for retention and protection of the cable assemblies and loose parts.

Item No.	Item Name
	(CCP 9227R1)
74314	INTERFACE TEST ADAPTER - F-16 AVIONICS COMPUTER

Figure 1a

FWP 4774A-4-75

SUPPORT EQUIPMENT RECOMMENDATION DATA (SERD)	DATE: 30 October 1986	DOC. NO. 16PR011	PAGE NO. 11

END ARTICLE	CONTRACTOR	CONTRACT NO.	QUANTITY	REV. NO.	CROSS INDEX
F-16 C/D	General Dynamics	F33657-82-C-2038		Original	

1 NOMENCLATURE	2 CAL	3 CRITICAL
ITA, F-16 AVIONICS COMPUTERS (CCP 9227)	2	ENG. ____ PROC. ____

4 ITEM NO.	5 SYSTEM AREA INDEX	6 WORD DESCRIPTION	7 AGE INDEX	8 NATIONAL STOCK NO. FSC	FIIN	9 FED. MFG.'S CODE PART OR DWG. NO.	10 MATCH CODE
74314	74	Computer	AA-9			81755 16U374314-1	

11 RESPONSIBLE AGENCY	12 PROPOSED SOURCE	13 EST. DATE 1ST. ARTICLE	14 EST. PROD. LEAD TIME	15 DATE OF APPROVAL	16 DATE REQ'D.	17 DEV. COST	18 END ITEM EFF.
	CFE	34 Months	24 Months			SEE CCP 9227R1	1 & ON*

REMARKS:

*Block 40

Prime________ **SMR Code**________ **Unit Price**________

Prod. Lead Time Plus Administration:________

Item Manager________ **Symbol**________ **Ext.**________

Operational Recommended Quantity Factor -

***Number to be determined by Program Authority Document.**

CD Engineer Roy A. Mayes **Ext.** 77120

SE	ORGAN	INTER	PDM	TDC	ATC		20 FACILITY REQUIREMENTS	21 TOTAL REC. QTY.	22 UNIT COST	23 TOTAL ON ORDER	24 TOTAL COST
O		*									
I											
[illegible]											

Figure 1b

SE REQUIREMENT LIST

Contractor GENERAL DYNAMICS
Contract No. F33657-82-C-2038
End Article Ident F16 C/D
Revision No. 1a Orig 1b
Date 30 October 1986

P/N 16U374314-1 NSN GFE No Page No. 12

LCC COMPLETED, SUMMARY FORWARDED No MIL HDBK 300 SCREENING ACCOMPLISHED Yes

AF REQUIRED	GD RECOMMENDED	
		• CONFIGURATION MANAGEMENT
1.	1.	1. PRIME ITEM (Denotes CI Spec Requirement)
2. X	2. X	2. CRITICAL ITEM (Denotes CI Spec Requirement)
3.	3.	3. NONCOMPLEX ITEM
4. X	4. X (NOTE 1)	4. STATUS ACCOUNTING REQUIRED
		• DESIGN
5. X	5. X (NOTE 6)	5. GENERAL DYNAMICS SPEC 16PS003
6.	6.	6. PER DEVIATION AS CITED IN SERD OR CI SPEC
6A X	6A. X	6A PARTS CONTROL IN ACCORDANCE WITH 16PP136A
		• TESTING
7. X	7. X (NOTE 2)	7. SYSTEM COMPATIBILITY TESTING
8. X	8. X (NOTE 3)	8. FIRST ARTICLE TESTING AS CITED IN CI SPEC
9. X	9. X (NOTE 3)	9. FIRST ARTICLE TEST PLANS/PROCEDURES (Items 1 & 2 Above)
10. X	10. X (NOTE 3)	10. FIRST ARTICLE TEST REPORT (Items 1 & 2 Above)
11. X	11. X (NOTE 3)	11. COMPATIBILITY TEST PROCEDURES (Items 1 & 2 Above)
12. X	12. X (NOTE 3)	12. COMPATIBILITY TEST REPORT
		• REVIEWS/INSPECTIONS
13.	13.	13. PRELIMINARY DESIGN REVIEW (PDR)
14.	14.	14. CRITICAL DESIGN REVIEW (CDR)
15. X	15. X (NOTE 1)	15. CONFIGURATION AUDITS
16. X	16. X (NOTE 1)	16. OTHER, SEE "REMARKS" BELOW
		• SE DATA
17.	17. X	17. SE ILLUSTRATIONS
18. X	18. X (NOTE 4)	18. CALIBRATION REQUIREMENT SUMMARY
19. X	19. X (NOTE 5)	19. ENGINEERING DATA (Reprocurement)
		PROVISIONING DATA (Information Only)
20. X	20.	20. CFAE/CFE NOTICES (Technical Orders) (For Tech Pubs)
21. X	21. X	21. RECOVERABLE ITEM BREAKDOWN (RIB) (For Spares Use)
		• OTHER
22.	22.	22. ATE SOFTWARE
23. X	23. X	23. MULTINATIONAL REQUIREMENT
24.	24.	24. OPTIMUM REPAIR LEVEL ANALYSIS (Record "ORLA" Only Required)

REMARKS

NOTE 1: Regular status accounting/configuration audits are required in accordance with 16PP153, for all development and production units.

NOTE 2: System Compatibility Test (SCT) to be accomplished on first deliverable unit.

NOTE 3: As defined in AIS Plan 16PP140-4A. Section 1A.

NOTE 4: CRS is required for each ITA which requires calibration.

NOTE 5: Engineering associated with this SERD will be prepared in accordance with 16PP140-11, Engineering Drawing Plan. The cost of reproduction and submittal of engineering data, excluding reprocurement data packages, is included in this proposal. Preparations, reproduction and submittal of reprocurement data packages and lists is subject to separate pricing and negotiations.

NOTE 6: Specification 16PS003, Appendix I is applicable prior to approval of applicable ITA I Specification. Upon approval, ITA CI specification shall govern.

LEGEND:		NAME	DATE
X – Original /Basic SERD Requirements R – Requirements Applicable To This Revision/Change • – And/Or 'Note ( )' – See Remarks ☐ RECORD CHANGE ONLY	ENGINEERING–YPEC	Brian Strusak	5 FEB 90
	LOGISTICS–YPL	[signature]	5 Feb 90

ITEM NO.	ITEM NAME
74314	INTERFACE TEST ADAPTER, F-16 AVIONICS COMPUTERS (CCP 9227R1)

DEPT 325-1 FWP 47748-4-83

CONSOLIDATED SUPPORT EQUIPMENT RECOMMENDATION DATA EVALUATION TRANSMITTAL

1 SERD NUMBER-REVISION: 74314 (Orig) 1773

2 TO:

3 CONTRACT NUMBER: F33657-82-C-2038

4 FSCM: 81755

5 REGISTRY CONTROL NUMBER: MMISP-2038

6 PART NUMBER: 16IL374314-1

7 NOMENCLATURE: ITA, F-16 Avionics Computers (CCP922)

8 NSN OR SIASCN: 4920NCE399614 WF

9 CONTRACTOR RECOMMENDED ITEM: ☒ CONCUR ☐ NONCONCUR

9A REASON FOR NONCONCURRENCE:

10 NSN OR PREFERRED/SUBSTITUTE ITEM:

10A FSCM:

10B PART NUMBER OF RECOMMENDED ITEM:

11 TOTAL CONTRACTOR RECOMMENDED QUANTITY: ☐ APPROVED ☐ QUANTITY CHANGED TO ____

11A REASON FOR QUANTITY CHANGE:

12 WEAPONS SYSTEM/SYSTEM TAs: 316, 317, 753

PDM TAs:

TRC TAs: 683 2 ea.

13 SMR CODE	14 ITEM MGT CODE	15 DEMIL CODE	16 MOE RULE CODE	17 PMI CODE	18 ADPE CODE	19 MOS CODE
PEFFFW	D	A	FUU4	A	Ø	1

20 DATA REQUIREMENTS (DOD DIRECTIVE 5000 19L ADMSOL) (Check appropriate block below)

	REQUIRED	NOT REQUIRED		REQUIRED	NOT REQUIRED
A SUPPORT EQUIPMENT ILLUSTRATIONS		✓	E SERD ITEM REQUIRES CMRS		
B REPARABLE ITEM PROVISIONING PARTS LIST	✓		F INCLUDE IN CMRS DATA ITEM		
C TECHNICAL ORDERS	✓		G ADDITIONAL PME EQUIPMENT/STANDARDS ARE REQUIRED FOR MAINTENANCE OR CALIBRATION SUPPORT OF SERD ITEM		
D SOFTWARE REQUIRED		✓			

21 COMMENTS

MMARC [signature]

MMADE Wayne E. Walker

MMISPC Margaret Ledesma

MAKEEF ....

MABEBB Dick Smiley

Concur with Requirement
RIB Required

22 ITEM MANAGER'S NAME MANE ....

ORGANIZATION SYMBOL:

AUTOVON/EXTENSION:

23 SERD MONITOR'S NAME: Margaret Ledesma

ORGANIZATION SYMBOL: MMISPC

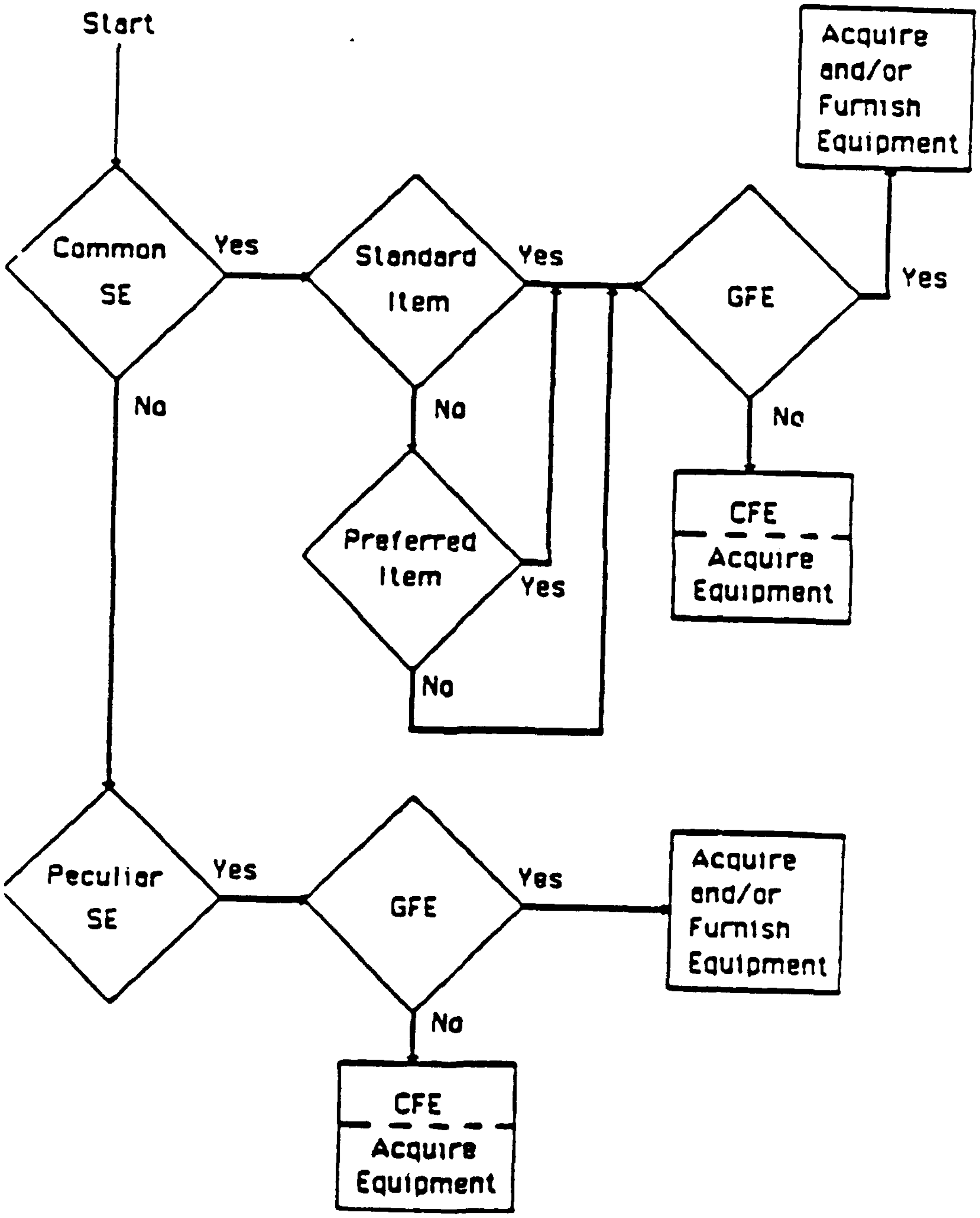
AUTOVON/EXTENSION: 458-6521

DATE: 14 Jan 87

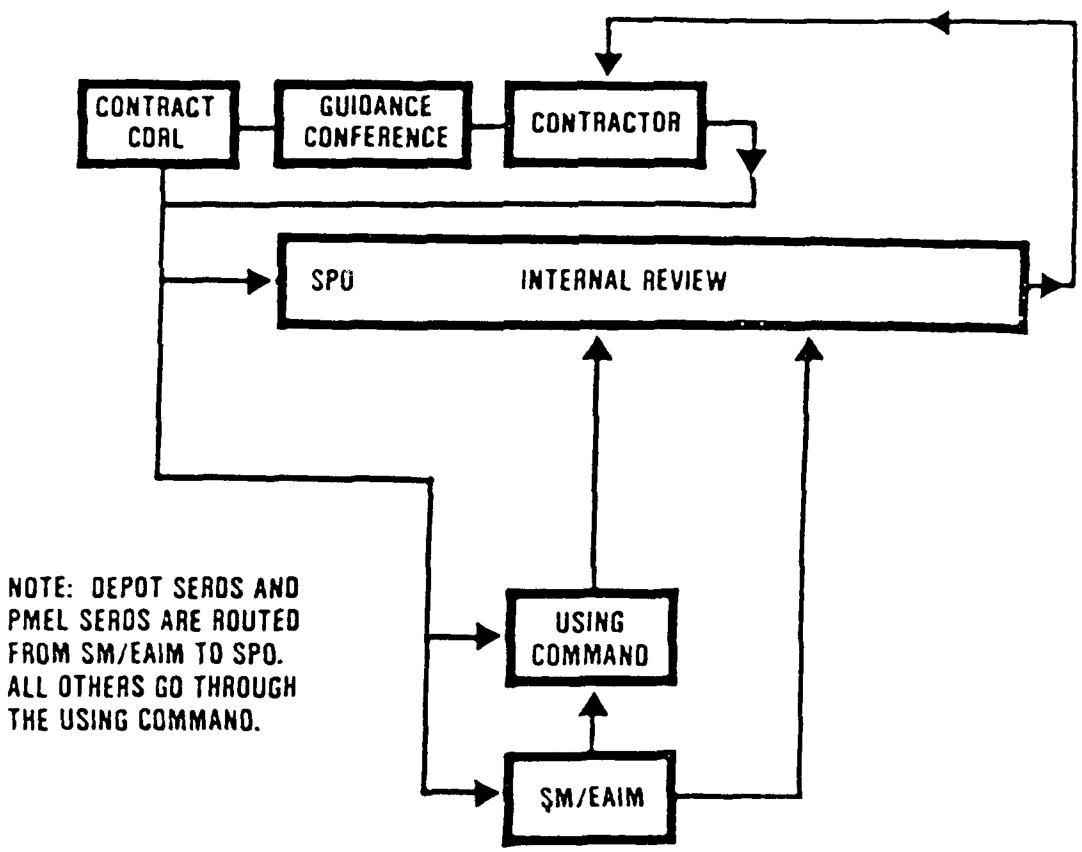
AFLC FORM 603 APR 83

PREVIOUS EDITION IS OBSOLETE

Appendix G: Support Equipment Decision Process



Appendix H: SERD Process



APPENDIX I: Interview Instrument One

An Analysis of the Support Equipment Acquisition Process and Methods Designed to Reduce Acquisition Leadtime

Interview Questions - INSTRUMENT ONE

Administrative Questions

1. What is your job title?
   ____

2. What is your rank or grade?
   ____

3. Please list months/years in current position.
   ____ Months ____ Years

4. Please list months/years in related positions.
   ____Months ____Years

5. Current position deals mainly with the area of:
   a) Logistics ____
   b) Acquisition ____
   c) Contracting ____
   d) Other ____________

6. Related positions dealt mainly with the areas of:
   a) Logistics ____
   b) Acquisition ____
   c) Contracting ____
   d) Other ____________

7. Please list weeks/months of training received in:
   a) Logistics ____|____
   b) Acquisition ____|____
   c) Contracting ____|____
   d) Other ____|____

8. Do you believe that your organization is adequately:
   a) Funded Y N
   b) Manned Y N
   c) Trained Y N
   d) Given authority Y N

9. On a scale of 1 to 5, please rank your management style/skills:

1	2	3	4	5
Very Low/Poor		Average		Very High/Good

   a) Aggressiveness ____
   b) Knowledge in area ____
   c) Demanding to detail ____
   d) Enjoyment of job ____
   e) Communications ____
   f) Leadership ____
   g) Knowledge of regs ____
   h) Team spirit ____

10. What percent of your work involves Foreign Military Sales?
    ____%

General Questions

11. On a scale of 1 to 5, please express your opinion on the following statements:

1	2	3	4	5
Strongly Disagree		Neither Agree or Disagree		Strongly Agree

____ a) "AFSC is concerned with cost, schedule, and performance of the weapon system and could care very little about support. Support is AFLCs problem".

____ b) "Problems encountered in our Foreign Military Sales (FMS) programs are symptomatic of USAF problems".

____ c) "The USAF takes contractor recommendations as gospel with little follow-up evaluation of their own".

____ d) "Support equipment (SE) is often considered as a follow-on buy and as such does NOT receive the management attention it should according to the Integrated Logistics Support (ILS) plan".

____ e) "Up-front definitization of ALL FMS programs should be mandatory and only those items definitized should be considered Late-to-Need at aircraft delivery time".

____ f) "Breakdown in communications often allow simple problems to go unnoticed until they become large problems and the lack of program management /planning can keep these large problems from being recognized. This is a fairly frequent occurrence in the F-16 community".

____ g) "Contractors are concerned with system first, then support".

____ h) "A lack of current regulations and ambiguous regulations frequently causes problems in the acquisition process".

____ i) "All regulations should be strictly adhered to regardless of their effect on the acquisition program".

____ j) "Milestones are only as good as the information used to formulate them. Frequently milestone dates are briefed that are known to be erroneous, but it is hoped that the problem can be corrected and that the dates may once again be true".

____ k) "There is a disproportionate amount of problems in our FMS programs compared to Air Force programs".

____ l) "In FMS programs, many SE items are considered 'critical' by the countries, when in fact they are merely nice to have. This causes undue management problems".

____ m) "In FMS programs, many SE items are considered 'critical' by the country, but not by the Air Force. Justification of critical items should be required prior to preferential treatment of orders".

____ n) "When considering SE items as Late-to-Need, less inference should be placed on the RAD date and more inference should be placed on the date the order was received".

____ o) "In FMS programs, the 'definitization' process could be greatly enhanced by utilizing one person from AFSC and one person from AFLC for SE definitization for all new or follow-on programs.

____ p) "The majority of the people in your organization are problem oriented ... have problem, work it; no problem, wait".

What about in: 1) AFSC ____ 3) AFLC ____
2) FMS ____ 4) Contractor ____

____ q) "SE design must be concurrent with system design to ensure supportability of the weapon system. All efforts required to fulfill this concept are met by our organization".

____ r) "There is a definite lack of 'openness' in communications between the various organizations ... organization may not say they have a problem unless specifically asked, and asked in a specific way".

____ s) "Frequently decisions are made by one organization or group without regarding the impact of that decision on other organizations or groups".

____ t) "All possible efforts are made to ensure the use of common SE instead of designing new SE to meet current needs".

____ u) "Specifications for SE are often developed by contractors to ensure that common SE is inadequate to meet the request, thus requiring new or peculiar SE procurement".

____ v) "Often requests for new or peculiar SE are approved because using commands want new equipment for new systems".

____ w) "More effort should be placed on contractually obligating the contractor to deliver on time. Slippages are fairly common and due to need we are forced to accept the slippage".

____ x) "Size, frequency, and difficulties in processing CCPs and ECPs have become more and more of a problem and frequently cause late delivery of SE".

____ y) "An interactive database management system for SE tracking, ordering, processing, delivery etc., accessible by AFSC, AFLC, ILC, and contractors and greatly enhance my job performance".

____ z) "Program Management Responsibility Transfer (PMRT) of part numbered items of SE versus by Support Equipment Recommendation Data (SERD) number, causes major problems in the acquisition process"

APPENDIX J: Interview Instrument Two

An Analysis of the Support Equipment Acquisition Process and Methods Designed to Reduce Acquisition Leadtime

Interview Questions - INSTRUMENT TWO

Support Equipment Manager Questions

12. What percent of the SE delivered to date has been delivered on-time? ____%

13. What percent of the SE delivered to date that has been delivered on-time, would have been late without micromanagement on your or a team members part? ____%

Questions 14 through 19 will be recorded on tape. Answers will be transcribed at a later time. This is not meant to intimidate the person being interviewed, but merely as a time saving convenience to the interviewer and as a means to ensure accuracy.

14. What do you believe is the most common cause of SE schedule slippage?

15. What is the average time required to place an item of SE on contract after initial receipt of order?

16. What is the primary cause of this time delay?

17. What do you believe is the number one reason for late support equipment delivery?

18. What can be done to alleviate this problem?

19. What other causes for late support equipment delivery exist?

APPENDIX K: Program Manager (Logistics)

Job Description (F-16 SPO)

Support Equipment Program Manager (Logistics)

A logistics program manager is responsible for providing complete logistics integration efforts including support equipment (O, I, &D), in order to fully support the logistics needs of the program. That person serves as the F-16 support equipment (SE) specialist directly responsive to the program manager (PM) for AFSC or AFLC. Takes all necessary actions to assure appropriate, support items to proper quantities are placed on order to meet requirements. Provides overall system analysis and integration of the organizational, intermediate, and depot SE, training, and avionics intermediate systems and other unique logistics aspects of the program. Assures that various subsystems of the SE that are being developed or produced will meet the overall performance, cost, and schedule requirements of the customers. Participates, as required, in meetings, conferences, critical and system design reviews, site surveys, physical and functional configuration audits, and other various logistics, engineering and planning/programming meetings which have designs, requirements, budget, production, delivery and/or operational implication. Assures that liaison is maintained with contractor personnel to assure timely project execution including equipment selection, development, testing, and delivery to meet operational need dates. Prepares and presents status briefings and reports as required, and keeps the program manager and other concerned parties appraised of the status of all projects and problem areas of the program.

APPENDIX L: Program Manager (Acquisition)

Job Description (F-16 SPO)

Support Equipment Program Manager (Acquisition)

Responsible for the development, acquisition, and management of support equipment (SE). Assesses hardware and software impacts of unique changes to existing or planned support equipment systems. Initiates proposals to modify existing equipment and develops peculiar support equipment as required. Develops and implements business strategies from development of statements of work through definitization. Identifies government furnished equipment (GFE) needs and coordinates procurement with AFSC or AFLC. Insures spares provisioning is accomplished to support requirements. Assesses schedule impacts and develops interim workaround procedures. Chairs support equipment status meetings with contractor and government representatives. Coordinates all phases of support equipment planning with the program managers, logistics managers, engineering managers, contractors, and other functional departments.

APPENDIX M: Additional Problem Areas

Additional Problems / Comments

This appendix is a compilation of pertinent, edited comments received in response to the interviews. The comments have been organized by responsibility (USAF or FMS). While the comments have been altered as far as sentence structure and abbreviations, the original intent remains unchanged.

A number of comments were deleted by the author as being inappropriate for publication. To provide a picture of the worthwhile sentiments of these comments, the author offers the following summation. "Finger pointing" was widely apparent. It would appear that a lack of communication exists among AFSC and AFLC with the prime contractor trying vainly to appease all.

USAF AND FMS

Management by exception is the norm.

Dual management & dual responsibilities.

Undertrained, funded, manned and too little authority.

Micromanagement is rampant.

Lack of communications.

Contractors are concerned with system sales.

Too many rules and regulations. Ambiguous!

Insupportable system milestones.

Erroneous, incorrect (known) milestones.

Have problem, work it ... no problem, wait.

insufficient funding.

Insufficient training.

Insufficient manning.

Too little authority.

Decisions made by persons NOT responsible.

Lack of computerization.

PMRT responsibility not truly established.

We PMRT part numbers, not SERDS.

Regs call for "Support Equipment Plan (SEP)" ... never seen one.

Revolving door manning.

Too much TDY for job accomplished.

TDY too long.

Inappropriate people on TDYs.

Too little TDY to accomplish job.

Lack of funds.

Inappropriate people at meetings, conferences, etc.

Regulations are outdated and too general.

Too little training in: acquisition, logistics, contracts.

PMRT lagtime.

Rules and regs used when advantageous, ignored when desired.

SPO does not have necessary logistics skills for job, therefore must rely on contractor.

Different skills and skill levels are necessary at different times in the acquisition process. SPO only has so many levels, so many skills available.

Slippages in schedule -- contractor has AFSC and AFLC over the proverbial barrel due to need and sole source.

Leadtime of many SE items are in excess of the 36 month A/C delivery plan.

Little logistics action/support until well after full scale development.

Front-end of program has little logistics support.

Little interaction with engineering.

Decisions made without regard to impact on other areas.

Changing baseline.

The only thing that is concurrent with weapon system design is weapon system design.

Supportability is not designed in, it's built-in or added.

Integrated logistics support is a buzz word that is talked about, written about, and ignored.

Instability of weapon system design and budget.

SE is considered follow-on support and is NOT given sufficient management attention.

Late-to-need based on RAD versus when ordered.

Using organizations want NEW SE for new systems.

Too much reliance on CFE.

Little effort at standardization/use of common SE.

Competition for resources increases as program matures.

No unified (contractor, AFSC, AFLC) SE tracking system.

Dual ordering of same item or subassembly.
No SE master plan.

Too much reliance on contractor and too little control over contractor actions.

Contractors need to be contractually held to delivery dates.

Size of CCPs are ridiculous.

Manufacture's leadtime is a WAG at best.

Little or no control over SE slippages.

Inadequate tracking of CCPs and ECPs.

Contractors do not give adequate notice of SE slippages.

No basic order of agreement available.

Too high a workload.

Impromptu orders.

Critical items are seldom really critical.

Reliance on workarounds the norm.

Excessive dependence on interim contractor support.

SERD process is a joke.

GFE/LM -- Government Furnished Equipment / Laughing Matter.

FMS PECULIAR

Lengthy turnaround time for questions, especially if in-country.

SNRs having a close working relationship with contractor/engineering -- often have info before SPO.

Releasibility.

USAF must make decision before offering to FMS.

Loss of tracking for FMS SE.

Inappropriate ordering.

Critical items specified, but not critical.

Too little control over SE substitution, usage, modifications, and workarounds.

Poor configuration management.

Insufficient, inefficient definitization.

SE should not be juggled (country to country in-house) without SE managers approval.

FMS considered bastard child.

No computer generated definitization list that is up to date.

Appendix N: Statistical Data

Question 11 Part A.

"AFSC is concerned with cost, schedule, and performance of the weapon system and could care very little about support. Support is AFLCs problem."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	3.061	2.600	3.800	3.000	Statistic
Std. Dev.	1.171	1.298	1.033	0.535	5.9630
Upper 95% CI	3.476	3.319	4.539	3.447	P-Value
Lower 95% CI	2.645	1.881	3.061	2.553	0.1134
Frequency					Parametric AOV
1	4	4	0	0	F-Value
2	5	3	1	1	2.09
3	13	4	3	6	P-Value
4	7	3	3	1	0.1095
5	4	1	3	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part B.

"Problems encountered in our Foreign Military Sales (FMS) programs are symptomatic of USAF problems."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	4.000	4.000	3.800	4.250	Statistic
Std. Dev.	0.829	0.926	0.919	0.463	1.0725
Upper 95% CI	4.294	4.513	4.457	4.637	P-Value
Lower 95% CI	3.706	3.487	3.143	3.863	0.7837
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	2	1	1	0	0.35
3	5	3	2	0	P-Value
4	17	6	5	6	0.7940
5	9	5	2	2	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part C

"The USAF takes contractor recommendations as gospel with little follow-up evaluation of their own."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.000	3.000	3.000	3.000	Statistic
Std. Dev.	0.830	1.069	0.667	0.535	0.2289
Upper 95% CI	3.294	3.592	3.477	3.477	P-Value
Lower 95% CI	2.706	2.408	2.523	2.553	0.9728
Frequency					Parametric AOV
1	2	2	0	0	F-Value
2	5	2	2	1	0.07
3	17	5	6	6	P-Value
4	9	6	2	1	0.9688
5	0	0	0	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part D

"Support equipment (SE) is often considered as a follow-on buy and as such does NOT receive the management attention it should according to the Integrated Logistics Support (ILS) plan."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.788	3.867	4.100	3.250	Statistic
Std. Dev.	0.857	1.060	0.568	0.463	7.3163
Upper 95% CI	4.092	4.454	4.506	3.637	P-Value
Lower 95% CI	3.484	3.280	3.694	2.863	0.0625
Frequency					Parametric AOV
1	1	1	0	0	F-Value
2	0	0	0	0	2.62
3	10	3	1	6	P-Value
4	16	7	7	2	0.0576
5	6	4	2	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part E

"Up-front definitization of ALL FMS programs should be mandatory and only those items definitized should be considered Late-to-Need at aircraft delivery time."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	3.242	3.000	3.800	3.000	Statistic
Std. Dev.	0.936	1.069	0.633	0.756	5.9703
Upper 95% CI	3.574	3.592	4.252	3.632	P-Value
Lower 95% CI	2.910	2.408	3.348	2.368	0.1131
Frequency					Parametric AOV
1	2	2	0	0	F-Value
2	3	1	0	2	2.09
3	15	8	3	4	P-Value
4	11	3	6	2	0.1091
5	2	1	1	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part F

"Breakdown in communications often allow simple problems to go unnoticed until they become large problems and the lack of program management /planning can keep these large problems from being recognized. This is a fairly frequent occurrence in the F-16 community."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	4.121	4.067	4.500	3.750	Statistic
Std. Dev.	0.781	0.884	0.527	0.707	4.6526
Upper 95% CI	4.398	4.556	4.877	4.341	P-Value
Lower 95% CI	3.844	3.577	4.123	3.159	0.1991
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	1	1	0	0	1.59
3	5	2	0	3	P-Value
4	16	7	5	4	0.1986
5	11	5	5	1	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part G

"Contractors are concerned with system first, then support."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.636	4.067	4.300	2.000	Statistic
Std. Dev.	1.168	0.704	0.675	0.756	18.3962
Upper 95% CI	4.050	4.456	4.783	2.632	P-Value
Lower 95% CI	3.222	3.677	3.817	1.368	0.0004
Frequency					Parametric AOV
1	2	0	0	2	F-Value
2	4	0	0	4	8.16
3	6	3	1	2	P-Value
4	13	8	5	0	0.0001
5	8	4	4	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part H

"A lack of current regulations and ambiguous regulations frequently causes problems in the acquisition process."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.939	3.600	4.000	4.500	Statistic
Std. Dev.	0.933	0.986	0.943	0.535	5.0809
Upper 95% CI	4.270	4.146	4.674	4.947	P-Value
Lower 95% CI	3.608	3.054	3.326	4.053	0.1660
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	3	2	1	0	1.75
3	6	5	1	0	P-Value
4	14	5	5	4	0.1640
5	10	3	3	4	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part I

"All regulations should be strictly adhered to regardless of their affect on the acquisition program."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	2.182	2.067	1.600	3.125	Statistic
Std. Dev.	0.917	0.799	0.699	0.641	12.5565
Upper 95% CI	2.507	2.509	2.100	3.661	P-Value
Lower 95% CI	1.857	1.624	1.100	2.589	0.0057
Frequency					Parametric AOV
1	9	4	5	0	F-Value
2	11	6	4	1	4.95
3	11	5	1	5	P-Value
4	2	0	0	2	0.0040
5	0	0	0	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part J

"Milestones are only as good as the information used to formulate them. Frequently milestone dates are briefed that are known to be erroneous, but it is hoped that the problem can be corrected and that the dates may once again be true."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.939	4.000	4.400	3.250	Statistic
Std. Dev.	0.788	0.655	0.699	0.707	9.3929
Upper 95% CI	4.219	4.363	4.900	3.841	P-Value
Lower 95% CI	3.660	3.637	3.900	2.659	0.0245
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	1	0	0	1	3.49
3	8	3	1	4	P-Value
4	16	9	4	3	0.0206
5	8	3	5	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part K

"There is a disproportionate amount of problems in our FMS programs compared to Air Force programs."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	2.485	2.800	2.300	2.125	Statistic
Std. Dev.	0.712	0.560	0.823	0.641	6.4234
Upper 95% CI	2.737	3.110	2.889	2.661	P-Value
Lower 95% CI	2.232	2.490	1.711	1.589	0.0927
Frequency					Parametric AOV
1	2	0	1	1	F-Value
2	15	4	6	5	2.27
3	14	10	2	2	P-Value
4	2	1	1	0	0.0883
5	0	0	0	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part L

"In FMS programs, many SE items are considered 'critical' by the countries, when in fact they are merely nice to have. This causes undue management problems."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.697	3.733	3.900	3.375	Statistic
Std. Dev.	0.883	0.884	0.994	0.744	1.7025
Upper 95% CI	4.010	4.223	4.611	3.977	P-Value
Lower 95% CI	3.384	3.244	3.189	2.753	0.6364
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	3	1	1	1	0.56
3	10	5	2	3	P-Value
4	14	6	4	4	0.6501
5	6	3	3	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part M

"In FMS programs, many SE items are considered 'critical' by the country, but not by the Air Force. Justification of critical items should be required prior to preferential treatment of orders."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.667	3.933	4.200	2.500	Statistic
Std. Dev.	0.990	0.799	0.633	0.756	13.9695
Upper 95% CI	4.018	4.376	4.652	3.132	P-Value
Lower 95% CI	3.316	3.491	3.748	1.868	0.0029
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	6	1	0	5	5.66
3	5	2	1	2	P-Value
4	16	9	6	1	0.0018
5	6	3	3	0	Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part N

"When considering SE items as Late-to-Need, less inference should be placed on the RAD date and more inference should be placed on the date the order was received."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	2.606	2.733	2.500	2.500	Statistic
Std. Dev.	0.899	1.033	0.972	0.535	0.5348
Upper 95% CI	2.925	3.305	3.195	2.947	P-Value
Lower 95% CI	2.287	2.161	1.805	2.053	0.9112
Frequency					Parametric AOV
1	4	2	2	0	F-Value
2	9	3	2	0	0.17
3	17	8	5	4	P-Value
4	2	1	1	4	0.9128
5	1	1	0	0	Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part O

"In FMS programs, the 'definitization' process could be greatly enhanced by utilizing one person from AFSC and one person from AFLC for SE definitization for all new or follow-on programs."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	3.303	2.867	2.900	4.625	Statistic
Std. Dev.	0.883	0.352	0.568	0.518	22.5659
Upper 95% CI	3.616	3.062	3.306	5.058	P-Value
Lower 95% CI	2.990	2.672	2.494	4.192	0.0000
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	4	2	2	0	10.99
3	20	13	7	0	P-Value
4	4	0	1	3	0.0000
5	5	0	0	5	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part P

"The majority of the people in your organization are problem oriented ... have problem, work it; no problem, wait."

What about in: 1) AFSC 3) AFLC
2) FMS 4) Contractor

Organization Respondent Belong To.

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	3.000	3.933	2.200	2.250	Statistic
Std. Dev.	1.090	0.704	0.633	0.707	21.6164
Upper 95% CI	3.386	4.323	2.652	2.841	P-Value
Lower 95% CI	2.614	3.544	1.748	1.659	0.0001
Frequency					Parametric AOV
1	2	0	1	1	F-Value
2	10	0	6	4	10.30
3	10	4	3	3	P-Value
4	8	8	0	0	0.0000
5	3	3	0	0	
					Hypothesis
Total	33	15	10	8	Rejected

Air Force Systems Command.

Statistic	Overall	AFSC	AFLC	GDFW
Mean	3.909	3.733	4.400	3.625
Std. Dev.	0.723	0.704	0.699	0.518
Upper 95% CI	4.165	4.123	4.900	4.058
Lower 95% CI	3.653	3.344	3.900	4.058
Frequency				
1	0	0	0	0
2	0	0	0	0
3	10	6	1	3
4	16	7	4	5
5	7	2	5	0
Total	33	15	10	8

Kruskal-Wallis
Statistic
6.5929
P-Value
0.0861

Parametric AOV
F-Value
2.33
P-Value
0.0815

Hypothesis
Accepted

Foreign Military Sales Representatives.

Statistic	Overall	AFSC	AFLC	GDFW
Mean	3.879	3.933	4.000	3.625
Std. Dev.	0.893	0.884	0.943	0.916
Upper 95% CI	4.195	4.423	4.674	4.391
Lower 95% CI	3.562	3.444	3.326	2.859
Frequency				
1	0	0	0	0
2	1	0	0	1
3	12	6	4	2
4	10	4	2	4
5	10	5	4	1
Total	33	15	10	8

Kruskal-Wallis
Statistic
0.6442
P-Value
0.8863

Parametric AOV
F-Value
0.21
P-Value
0.8900

Hypothesis
Accepted

Air Force Logistics Command.

Statistic	Overall	AFSC	AFLC	GDFW
Mean	4.182	3.733	4.600	4.500
Std. Dev.	0.683	0.594	0.516	0.535
Upper 95% CI	4.424	4.062	4.969	4.947
Lower 95% CI	3.940	3.405	4.231	4.053
Frequency				
1	0	0	0	0
2	0	0	0	0
3	5	5	0	0
4	17	9	4	4
5	11	1	6	4
Total	33	15	10	8

Kruskal-Wallis
Statistic
12.0380
P-Value
0.0073

Parametric AOV
F-Value
4.70
P-Value
0.0052

Hypothesis
Rejected

General Dynamics Corporation, Fort Worth, TX.

Statistic	Overall	AFSC	AFLC	GDFW
Mean	2.909	2.800	3.000	3.000
Std. Dev.	0.723	0.775	0.667	0.756
Upper 95% CI	3.165	3.229	3.477	3.632
Lower 95% CI	2.653	2.371	2.523	2.368
Frequency				
1	0	0	0	0
2	10	6	2	2
3	16	6	6	4
4	7	3	2	2
5	0	0	0	0
Total	33	15	10	8

Kruskal-Wallis
Statistic
0.6896
P-Value
0.8757

Parametric AOV
F-Value
0.22
P-Value
0.8802

Hypothesis
Accepted

Question 11 Part Q

"SE design must be concurrent with system design to ensure supportability of the weapon system. All efforts required to fulfill this concept are met by our organization."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.576	3.267	3.800	3.875	Statistic
Std. Dev.	0.969	1.100	0.919	0.641	2.7664
Upper 95% CI	3.919	3.876	4.457	4.411	P-Value
Lower 95% CI	3.232	2.658	3.143	3.339	0.4291
Frequency					Parametric AOV
1	1	1	0	0	F-Value
2	3	2	1	0	0.92
3	10	6	2	2	P-Value
4	14	4	5	5	0.4390
5	5	2	2	1	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part R

"There is a definite lack of 'openness' in communications between the various organizations ... organization may not say they have a problem unless specifically asked, and asked in a specific way."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.848	4.067	3.900	3.375	Statistic
Std. Dev.	0.755	0.884	0.568	0.518	5.5664
Upper 95% CI	4.116	4.556	4.306	3.808	P-Value
Lower 95% CI	3.581	3.577	3.494	2.942	0.1347
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	1	1	0	0	1.94
3	9	2	2	5	P-Value
4	17	7	7	3	0.1315
5	6	5	1	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part S

"Frequently decisions are made by one organization or group without regarding the impact of that decision on other organizations or groups."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	4.121	4.267	4.800	3.000	Statistic
Std. Dev.	1.023	1.033	0.422	0.535	15.4364
Upper 95% CI	4.484	4.839	5.102	3.447	P-Value
Lower 95% CI	3.758	3.695	4.498	2.553	0.0015
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	3	2	0	1	6.44
3	6	0	0	6	P-Value
4	8	5	2	1	0.0008
5	16	8	8	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part T

"All possible efforts are made to ensure the use of common SE instead of designing new SE to meet current needs."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	3.394	2.800	3.500	4.375	Statistic
Std. Dev.	0.998	0.862	0.707	0.744	13.5291
Upper 95% CI	3.748	3.277	4.006	4.997	P-Value
Lower 95% CI	3.040	2.323	2.994	3.753	0.0036
Frequency					Parametric AOV
1	1	1	0	0	F-Value
2	5	4	1	0	5.43
3	11	7	3	1	P-Value
4	12	3	6	3	0.0023
5	4	0	0	4	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part U

"Specifications for SE are often developed by contractors to ensure that common SE is inadequate to meet the request, thus requiring new or peculiar SE procurement."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	2.939	3.200	3.800	1.375	Statistic
Std. Dev.	1.116	0.676	0.633	0.518	20.6364
Upper 95% CI	3.335	3.574	4.252	1.808	P-Value
Lower 95% CI	2.544	2.826	3.348	0.942	0.0001
Frequency					Parametric AOV
1	5	0	0	5	F-Value
2	5	2	0	3	9.61
3	11	8	3	0	P-Value
4	11	5	6	0	0.0000
5	1	0	1	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part V

"Often requests for new or peculiar SE are approved because using commands want new equipment for new systems."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	2.909	3.200	2.800	2.500	Statistic
Std. Dev.	0.805	0.862	0.789	0.535	4.3766
Upper 95% CI	3.194	3.677	3.364	2.947	P-Value
Lower 95% CI	2.624	2.723	2.236	2.053	0.2236
Frequency					Parametric AOV
1	1	0	1	0	F-Value
2	8	3	1	4	1.49
3	18	7	7	4	P-Value
4	5	4	1	0	0.2243
5	1	1	0	0	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part W

"More effort should be placed on contractually obligating the contractor to deliver on time. Slippages are fairly common and due to need we are forced to accept the slippage."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	4.061	4.333	4.500	3.000	Statistic
Std. Dev.	0.933	0.724	0.527	0.926	11.8905
Upper 95% CI	4.392	4.734	4.877	3.774	P-Value
Lower 95% CI	3.730	3.933	4.123	2.226	0.0078
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	3	0	0	3	4.63
3	4	2	0	2	P-Value
4	14	6	5	3	0.0056
5	12	7	5	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part X

"Size, frequency, and difficulties in processing CCPs and ECPs have become more and more of a problem and frequently cause late delivery of SE."

Statistic	Overall	AFSC	AFLC	GDFW	
					Kruskal-Wallis
Mean	4.364	4.600	4.600	3.625	Statistic
Std. Dev.	0.653	0.507	0.516	0.518	12.4132
Upper 95% CI	4.595	4.881	4.969	4.058	P-Value
Lower 95% CI	4.132	4.319	4.231	3.192	0.0061
Frequency					Parametric AOV
1	0	0	0	0	F-Value
2	0	0	0	0	4.88
3	3	0	0	3	P-Value
4	15	6	4	5	0.0043
5	15	9	6	0	
					Hypothesis
Total	33	15	10	8	Rejected

Question 11 Part Y

"An interactive database management system for SE tracking, ordering, processing, delivery etc., accessible by AFSC, AFLC, ILC, and contractors and greatly enhance my job performance."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	4.303	4.200	4.600	4.125	Statistic
Std. Dev.	0.918	1.207	0.699	03545	3.1373
Upper 95% CI	4.629	4.868	5.100	4.421	P-Value
Lower 95% CI	3.978	3.532	4.100	3.829	0.3709
Frequency					Parametric AOV
1	1	1	0	0	F-Value
2	0	0	0	0	1.05
3	4	3	1	0	P-Value
4	11	2	2	7	0.3709
5	17	9	7	1	
					Hypothesis
Total	33	15	10	8	Accepted

Question 11 Part Z

"Program Management Responsibility Transfer (PMRT) of part numbered items of SE versus by Support Equipment Recommendation Data (SERD) number, causes major problems in the acquisition process."

Statistic	Overall	AFSC	AFLC	GDFW	Kruskal-Wallis
Mean	3.394	3.133	4.000	3.125	Statistic
Std. Dev.	0.864	0.990	0.667	0.353	8.3697
Upper 95% CI	3.700	3.682	4.477	3.421	P-Value
Lower 95% CI	3.088	2.585	3.523	2.829	0.0390
Frequency					Parametric AOV
1	1	1	0	0	F-Value
2	2	2	0	0	3.05
3	16	7	2	7	P-Value
4	11	4	6	1	0.0344
5	3	1	2	0	
					Hypothesis
Total	33	15	10	8	Rejected

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