AN ANALYSIS OF THE IMPACT OF INTEGRATED WEAPON SYSTEM MANAGEMENT (IWSM) UPON THE SUPPORT EQUIPMENT ACQUISITION PROCESS (COVERING THE PERIOD FROM SUBMITTAL OF SERD* THROUGH THE PREPARATION OF THE STATEMENT OF WORK)

THESIS

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THESIS

Presented to the Faculty of the School of Logistics and Acquisition Management

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Requirements for the Degrees of

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and

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Abstract

This study investigated the impact of the implementation of Integrated Weapon System Management (IWSM) on the support equipment acquisition process. The literature search revealed that IWSM is the latest of many Air Force attempts to ensure all aspects of a weapon system's life cycle are considered when acquisition decisions are made. Areas of interest included organizational structure; inter-functional relationships; procedural changes; and procedural guidance and automated tools used. Two years after IWSM implementation, interviews were conducted with twenty-four people in various functional disciplines in four System Program Offices and included both Aerospace Systems Center (ASC) and Air Logistics Center (ALC) personnel. Although there were no significant changes in office structure, the use of the term "Integrated Product Team" to describe working groups had improved the inter-functional relationships and communication among offices. This shortened the time required to perform some steps of the process. The research found little or no common procedural guidance used among the SPOs, other than the Federal Acquisition Regulation (FAR) for contracting. Also, SPO-unique software was in common use, instead of automated tools from the Acquisition Logistics Toolbox and Index.

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I. Problem Statement

Introduction

This thesis will examine the support equipment (SE) acquisition process, from the submittal of the support equipment recommendation data (SERD*) through preparation of the Statement of Work (SOW), to determine the extent of the impact of the implementation of Integrated Weapon Systems Management (IWSM) on this process. Prior to implementation of IWSM, high visibility end items overshadowed integrated logistics support (ILS) elements such as support equipment (SE). This overshadowing resulted in delays in identification of support equipment requirements, shortages of resources assigned to SE, and crash programs designed to correct the problems that these conditions engendered (24: 2).

These conditions rarely existed prior to WW II; little attention was paid to SE because weapon systems and their support equipment were relatively simple (23: 12). As a result of the war, weaponry became more sophisticated. SE followed suit, but, as Shipp,

Clellen, and Danielson observed in 1958, "The emphasis continued to be largely on the airborne equipment components, due to the glamour connected with the 'bird' and the drudgery associated with the ground support element"(70: 2). This emphasis was institutionalized in 1951 when the Air Research and Development Command (ARDC) was spun off from the Air Material Command (AMC) and the acquisition of weapons systems became a series of joint ventures between the two commands (46: 4-5). For the next forty years the lines of responsibility between development and sustainment were open to constant interpretation and debate (70: 3; 46: 4-6; 23: 12-14). The intent of IWSM is to eliminate the debate by making the acquisition process seamless, with no separation or hand-off as the system/product moves from development to deployment and sustainment. This change from the previous policy of having one office responsible for acquisition, then another office responsible for sustainment, was intended to improve Air Force integrated logistics support (ILS). Research was done over the last three years to investigate how IWSM was being implemented, but no work was done to see if IWSM was addressing some of the perennial problems that it was intended to correct .

Definitions

In the early days of aviation, SE consisted of little more than chamois skin to strain gasoline, bailing wire, banana oil, and linen for repairs, plus a few simple hand tools and miscellaneous boxes and crates to serve as scaffolds and ladders (70: 1). By the late 1950's the definition in Military Change Proposal (MCP) 71-650 had expanded to include:

> Any and all implements or devices which are required to inspect, test, adjust, calibrate, appraise, gauge, measure, repair, overhaul, assemble,

> disassemble, transport, safeguard, record, store, actuate, and/or otherwise maintain the original functional operating status of an Air Force weapon system, associate system, end item or components. (Quoted in 70: 11)

This definition still applies, although the writer(s) of MCP 71-650 would never have imagined the level of complexity in the SE carried in today's inventories.

One of the best definitions of IWSM was written by Assistant Secretary of the Air Force J. J. Welch in his foreword to the C-17 IWSM Implementation Plan:

> Integrated Weapon System Management (IWSM) is the cornerstone of AFMC. IWSM is a management process covering a weapon system or commodity over its complete life cycle -- "cradle-to-grave", from no later than Milestone I through system retirement/ cancellation. There will be a single face to the user, the system program director, heading a single organization, the system program office, managing the weapon system or commodity. This program will be a seamless organization, operated with critical processes that are integrated across the life cycle. The IWSM concept is revolutionary; a step toward the future and fundamentally a change in current business practices, demanding cultural changes of every member of the Air Force Materiel Command. (9: Foreword)

Integrated Weapon System Management was first implemented in 1991 during the merger of the Air Force Systems Command (AFSC) and the Air Force Logistics Command (AFLC) into Air Force Materiel Command (AFMC). Since that time, IWSM has been officially defined as:

> the AFMC <u>management philosophy</u> for acquiring, evolving, and sustaining our products. It empowers a single manager with authority over the widest range of decisions and resources to satisfy customer requirements throughout the life cycle of the product (35: 9).

That is, IWSM is a philosophy that embodies a life-cycle approach to weapon system management and incorporates all ten ILS elements: support equipment; supply support; maintenance planning; manpower and personnel; technical data; training; computer

resources; design interface; facilities; and packaging, handling, and transportation (55: 1.8). As IWSM is currently defined, its key elements are: Total Quality Air Force (TQ), Cradle to Grave, Single Face to the User, Seamless Processes, Empowered People, Common Sense Approach, Integrated Product Development (IPD), and Product Focus (35: 11). The research interviews were designed to look for these elements as a means of assessing how well the IWSM philosophy was being integrated into the way AFMC conducted its day-to-day business of acquiring SE.

For the purposes of this thesis, the support equipment acquisition process is defined as the steps required from submitting the support equipment requirements data (SERD*) in the Logistics Support Analysis Record (LSAR-E) to completion of a statement of work (SOW) prior to awarding a contract to develop and manufacture a particular piece of equipment that will support one or more end items of a major weapon system. The major elements of this process are the SERD*, the Support Equipment Recommendation Document (SERD), the Engineering Change Proposal (ECP), and the SOW.

The IWSM Guide (AFMPC 800-60) states that IWSM seeks to change the approach to the process rather than the process itself. Under IWSM there should be surprisingly little change in the SE contract process itself (35: 129). Integrated product teams (IPT), a key facet of IWSM implementation, seek to remove any barriers between functional areas and to improve the potentially adversarial relationship between contractor and government. The guide proposes to leave guidelines and regulations intact. However, in the process of changing over to an IWSM approach, many regulations that

supported SE acquisitions have been rescinded. This thesis will document the impact, if any, of these IWSM-connected changes upon the SE acquisition process from the submittal of the SERD* through preparation of the SOW.

Objective

The objective of this study is to examine IWSM's impact on the support equipment acquisition process. This study will analyze the experiences of four selected System Project Offices (SPO) in acquiring SE. Some of these programs had completed end item development before IWSM was implemented and some had end items in the developmental stages when IWSM was implemented. This research identified changes in the SE acquisition process made since IWSM implementation; identified those changes which resulted from IWSM; identified the impact of these changes on the time required to complete the contracting process; and, finally, identified the extent to which the adoption of IWSM has succeeded in developing a new culture for doing business.

Scope

Some aspects of support equipment acquisition, such as engineering change proposals (ECP), will be addressed only insofar as they impact the actual acquisition of support equipment. Rather than delve into the issues of integration and common items, this study will limit itself to examining the process. This research will provide an objective study for the IWSM and Air Force Office of Support Equipment Management (AFOSEM) offices to use in their assessment of how well IWSM is performing to date. Note:

AFOSEM was absorbed into ASC/ALXX during the time this study was being conducted and is no longer found in the organizational charts. However, the term "AFOSEM" will be used throughout this report, because it remains the popular identification of this staff function.

Overview

The remainder of this thesis presents a review of the applicable literature; describes the methodology used; discusses the results of document reviews and interviews from the sample of existing programs; and proposes recommendations and conclusions. The literature review in Chapter II focuses on the history of SE acquisition management, DoD and Air Force guidance for support equipment acquisition, and previous IWSM and support equipment acquisition research. Chapter III, *Methodology*, discusses the research plan, research methods, data collection, and the data analysis approach. Chapter IV, Results, presents the data collected from each weapon system. Chapter V, the final chapter, includes conclusions drawn from the research, feedback for our sponsors, and recommendations for future research. Finally, the appendices provide (1) more extensive definitions of terms, (2) definitions of acronyms, (3) a bibliography, (4) a process flowchart, (5) applicable tables, and (6) research data.

II. Literature Review

Introduction

This thesis contains a thorough review of existing literature concerning the Integrated Weapon System Management (IWSM) as it relates to support equipment acquisition. IWSM is a philosophy that embodies a life-cycle approach to weapon system management and incorporates all ten of the integrated logistics support (ILS) elements. IWSM treats the process of acquiring, evolving, and sustaining products as an uninterrupted flow with a single manager (28: 16).

Each "single manager" is responsible for a system or collection of systems in one of three categories: weapon system, product group, or material group (see Appendix A for definitions; 35: 10). This responsibility continues throughout the entire life cycle of the system, from conception to disposal. Throughout the life cycle of the system, the manager has authority over the widest range of decisions and resources to satisfy customer requirements. The manager accomplishes the core processes or management tasks (see Appendix A) through the use of Integrated Product Teams (IPT) that "put the right people in the right place at the right time to make the right decision" (28: 17).

The conversion to the IWSM philosophy requires a metamorphosis on the part of the Air Force acquisition community. In the past, the Aeronautical System Division (ASD) of the Air Force Systems Command (AFSC) managed the development and procurement of support equipment (SE) for the user with input from both the user and the

sustaining activity in the Air Force Logistics Command (AFLC). Once initial deployment had been achieved, AFLC was responsible for sustainment. Now AFSC and AFLC have been combined into the Air Force Materiel Command (AFMC). A goal of this merger is to have the acquisition process become seamless, with no separation or hand-off as the system/product moves from development to deployment and sustainment. Both the user and the sustainer become team members rather than observers of the process. This change from the previous policy of having one office responsible for acquisition and another office responsible for sustainment requires more than superficial conformance to a revised set of regulations; it requires a transformation of strategy, power, structure and controls (76: 171). This thesis both explores the superficial changes of regulation, policy, and procedure; and traces the progress being made in the organizational metamorphosis of the SE acquisition community demanded by IWSM.

Precedents of IWSM

Prior to World War II, aircraft, communications, and detection systems were comparatively simple; the technology was similar to that used in the private sector, and little special support equipment was needed (23: 12). However, World War II unleashed the enormous scientific and manufacturing capabilities of the United States to advance aerospace technology (70: 1-2). As weapon systems became more sophisticated, logistics problems became more complex because little consideration was given to support requirements until very late in the development cycle (23: 13-14).

After WWII, post-war budget cuts severely restricted the amount of long-term research and development (R&D) the War Department could perform (46: 4). The available funds were barely adequate to support existing systems, with no surplus for contracts "classifying, defining, and collecting data on all items of electronics test equipment of interest to the USAF, and for evaluating the data and making recommendations for improvements" (70: 2). The establishment of the Air Force as a separate service created even more competition for scarce dollars. In 1951, the Defense Department formed a separate Air Research and Development Command (ARDC), with separate funding and primary responsibility for research, development, and engineering of new weapon systems (40: 17). The ARDC controlled projects through the development phase and the Air Material Command (AMC) assumed responsibility when production began. Joint project offices, composed of personnel from both commands, managed system acquisition. The joint authority caused constant problems. As weapon systems became more complex, the dividing line between development and production became more blurred, requiring constant examination and debate over which command was responsible for what action at any given time (46: 4-5). The impact of development decisions on life cycle cost was frequently ignored in the interest of reducing initial costs.

Project management organizations were born when the first project management strategy was applied to the ICBM program (40: 18). The Department of Defense Reorganization Act of 1958 laid the groundwork for an acquisition management structure, but this act was not fully implemented until Robert McNamara became Secretary of Defense in 1961 (40: 18). That year, the Air Force Systems Command (AFSC) was

created, with a charter to control weapon system development through the time the system entered the operational inventory. Unfortunately, the AFSC charter did not assimilate the concerns of the logistics community. Logisticians were effectively isolated from the process until a system achieved operational capability; at that point, responsibility would be transferred to the equally new Air Force Logistics Command (AFLC) (46: 5; 40: 18).

This new arrangement did not solve the problems of split authority which ARDC and AMC had experienced. There were still two commands involved in weapon system management; the problem of how and when to do the program management responsibility transfer (PMRT) had merely been shifted from the beginning of production to the beginning of operational use. Logistic support and life cycle cost considerations were still frequently neglected in favor of the cost and schedule of fielding the first examples of a new weapon system (46: 5). Lack of interface among the implementing command, the supporting command, and the using command often resulted in significant disconnects between the mission needs statement and the final product.

The Air Force studied the problem and, in the late 1960s, adopted the management philosophy of Integrated Logistics Support (ILS). ILS is defined as "a composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle" (23: 15). To implement the ILS philosophy, the Air Force developed a matrix organizational structure, with a dual chain of command -- functional and program.

A matrix organization employs a project-management concept which cuts across functional lines to concentrate responsibility for accomplishment upon a project manager and views activities as an integrated totality (81: 489). As implemented in the Air Force, personnel were assigned to functional offices and reported to a functional supervisor, who was responsible for all personnel actions. At the same time, they were "matrixed" to a program/project office and received their day-to-day taskings from the program manager. This was a notable revision of previous practices, of having organizations arranged along functional lines, and was significant enough to be included in books on the theory of management. In 1972, Daniel Wren wrote:

> The concept of project management or the "matrix organization" has also become a part of organization theory. Emerging from the complexities of managing aerospace and other projects for the Department of Defense and the National Aeronautics and Space Administration, the project-management concept cuts across functional lines to concentrate responsibility for accomplishment upon a project manager. The project manager, who may be a government official or a manager from a contracting organization, has responsibility for various functions which contribute to a given objective. The project-management concept has also led to the development of planning-programming-budgeting systems (PPBS) which cut across functional lines to view activities as an integrated totality. Both organization theory and systems analysis areas have been affected by the development of the project-management concept. (81: 489)

Each System Program Office (SPO) within AFSC was instructed to establish an ILS office which would be a liaison between AFSC and AFLC. The ILS office was to be headed by a Deputy Program Manager for Logistics (DPML), who was to be responsible for ensuring that the impact of all elements of logistics were considered as early as possible in the system development process(46: 11). Theoretically, the DPML was provided by AFLC, was part of AFLC rather than AFSC, and contributed a series of

checks and balances to the AFSC viewpoint. Logistic support continued to suffer from lack of attention primarily because this theory was not implemented as intended. In practice, the DPML usually had little real authority and, as a result of the matrix system, suffered from having his or her loyalties divided between AFLC and the program manager (46: 11). Also, policy and/or priority disagreements between the functional and program managers sometimes resulted in conflict and confusion and an overall higher level of stress in the SPO (40: 56).

There were attempts to fix the process. Starting in 1986, the government issued a number of directives; the most prominent ones were the Goldwater-Nichols DoD Reorganization Act, the Defense Acquisition Improvement Act and the Defense Management Report to the President. The goal of these directives was to have the Defense community work as a team led by the Under Secretary of Defense for Acquisition. The "new" policy restated the traditional policy: DoD was to employ teamwork, manager's participation, integrity, and accountability during acquisition (80: 4). However, the directives did not change the culture under which system acquisitions were managed. SE was often late to need and without a complete integrated logistics support package (80: 9).

Beginnings of IWSM

It was in this climate of continued late and inadequate logistic planning and support that the concept of IWSM was born. By 1990, the Air Force began making changes out of necessity rather than choice (65: 3). Congress had declared a "peace

dividend" with the fall of the Berlin Wall and the dissolution of the Soviet Union. The DoD was facing severe budget cuts in all areas. The situation is expressed in an anecdote quoted in KAIZEN, where an unnamed American company chairman tells his executive committee, "Gentlemen, our job is to manage change. If we fail, we must change management" (47: 2).

A series of Process Action Teams (PAT) convened to review the entire process of acquisition and support (1: 18.8-9). Based on their recommendations and on other outside influences, the AF chose to adopt the philosophy of IWSM (1: 18.2-3). IWSM does not cancel the ILS philosophy; instead, it provides the means to strengthen the Air Force emphasis on ILS. Even though Tevino thinks IWSM a very different approach to acquisition, it is a natural outgrowth of the original matrix theory and of the Total Quality Management (TQM) philosophy started by Dr. W. Edward Demming (74: 18). This thesis will not explore TQM except in the area of empowerment and its relationship to the integrated product team concept.

A Preliminary Definition of IWSM

The commanders of AFLC and AFSC had given the PAT teams three objectives. First, they were to integrate the work force and infrastructure of the two commands and synergistically employ the strengths of both. Secondly, they were to improve the current business practices by providing a completely integrated weapon system management process using a cradle-to-grave philosophy. Finally, they were to provide a single face to operational commands that would cover all aspects of integrated weapon system

management and establish a clear line of accountability that would enhance responsiveness (1: 18.3). The key to implementing IWSM was to be the scheduled merger, in 1991, of AFSC and AFLC into a single Air Force Materiel Command (AFMC). This merged command would combine all the responsibilities of the two separate commands, eliminate the divided loyalties which DPMLs experienced, and make a single system program office responsible for the system from the time a development decision was made until the disposal of its last unit.

Eliminating the PMRT was to provide a strong incentive for the program manager to consider all the ILS elements as early as possible in the development stage. A program manager's performance would no longer be judged solely on the cost and schedule of the system's initial operational readiness. Instead, the program manager's reputation depended partly on how *well the ten ILS elements* -- support equipment, supply support, maintenance planning, manpower and personnel, technical data, training, computer resources, data interface, facilities, and packaging, handling, and transportation -- were incorporated into the development and acquisition of the system.

IWSM Implementation

The first visible signs of IWSM appeared in 1991, when pilot programs were selected to test the revised system acquisition process. It was first reported that there would be sixteen pilot programs selected, in various stages of research, development, production, and deployment, but, officially, twenty-one programs were chosen for the pilot effort (see Appendix C) (42: 64; 1: 18.8; 29: 2). Based upon lessons learned in the

pilot phase, an IWSM Implementation Guide was developed to provide implementation guidance to all programs (29: 2). The IWSM Guide (AFMCP 800-60) and a companion Integrated Product Development (IPD) Guide were published in March 1993 and May 1993, respectively (35; 37). In October 1993, the IPD Guide was incorporated into AFMCP 800-60 (36). The pilot conversions were considered successful, and at the Horizons Conference of February 1994, it was reported that ninety-two of the ninety-four ASC programs had reorganized into IPTs (45: 5).

IWSM. The IWSM Implementation Guide defines IWSM as "the AFMC management philosophy for acquiring, evolving, and sustaining our products," and further states, "IWSM empowers a single manager with authority over the widest range of decisions and resources to satisfy customer requirements throughout the life cycle of the product" (35: 9). The Guide lists the key elements of IWSM as Total Quality Air Force (TQ), Cradle to Grave, Single Face to User, Seamless Processes, Empowered People, Common Sense Approach, Integrated Product Development (IPD), and Product Focus. Figure 1 illustrates how closely these elements are interrelated (35: 11).

Along with the IWSM Guide, Headquarters AFMC released a series of video tapes based on the findings of the PAT teams (35; 48; 49; 61; 62; 63; 64). Some of these videos were designed as lead-ins to orientation seminars which were to prepare individual functional areas for the changes they could anticipate as a result of both the merger and the adoption of IWSM (61; 62; 63; 64). Other videos were designed for release to the

ALCs or other Air Force organizations that interfaced with AFMC (48; 49). Those videos which applied to this research have been listed in the Bibliography.

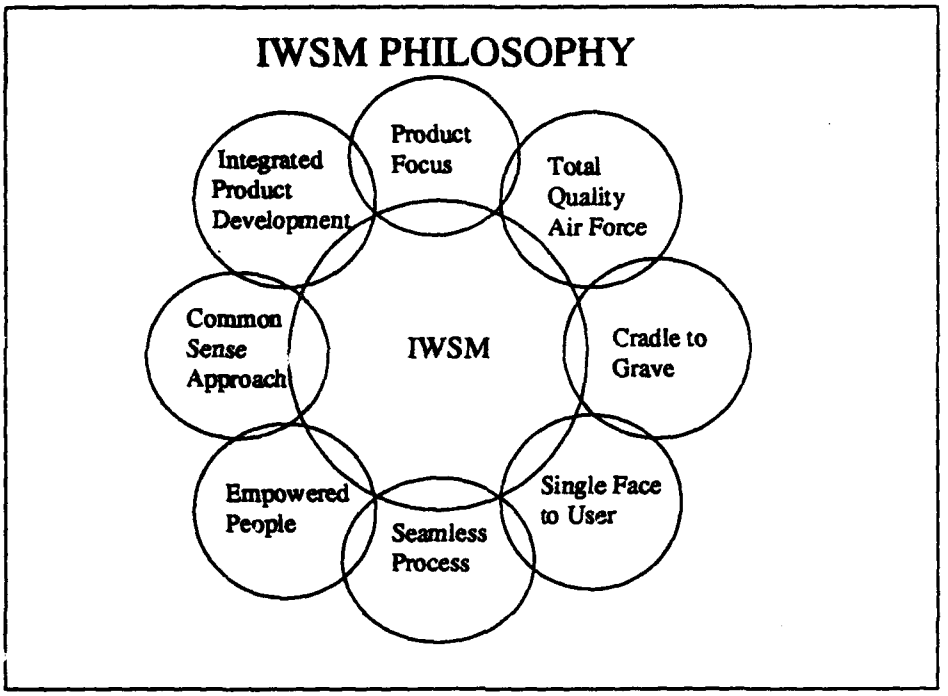


Figure 1

(35: 11)

Integrated Product Development (IPD). Obviously, none of the IWSM elements stands alone, but it is IPD that most impacts this thesis. The IWSM philosophy introduced the concept of "gold standards" (best practices, see Appendix A) which changed the focus to optimizing the product -- even when that requires sub-optimizing a functional process. The IPD portion of IWSM has the single manager "empowering" the Integrated Product Teams (IPT), and the individuals who make up these teams, with the resources and authority to make decisions at the lowest appropriate level. The intent of

this delegation of authority is to allow for more timely and precise decisions using more timely and precise data (37: 7).

IPD "systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient product that satisfies customers' needs" (37: 5). In the past, if adequate SE for organic maintenance was not in place when the weapon system was ready for initial deployment, the customers' needs for maintenance were satisfied by interim contractor support (ICS). Applying IPD to weapon system development is intended to ensure that the development and acquisition of SE are included as early as possible in the process (35: 147). This logically reduces the need for ICS by minimizing the lag between weapon system deployment and availability of SE.

Integrated Product Teams (IPT). The concept of the IPT is as essential to IPD as IPD is to IWSM; the IPT translates IPD from promise into reality. AFMCP 800-60 calls team building Task #1. Quoting from this document will demonstrate the emphasis that the Air Force places on the task. "This task is the **KEY TO SUCCESS!** ***You must establish a solid, dedicated, and knowledgeable team, consisting of key members from the acquisition program office and support program office***" (sic) (35: 21). This document neglects to say what constitutes a team and defines the IPT by what it is supposed to do rather than by what it is. AFMCP 800-60 also fails to tell the reader how to build an IPT; it only refers one to the local Quality Office for assistance and training (35: 21). Integrated Weapon System Management (IWSM) Model (AFMCR 500-11) also

fails to define a team but does define Centers of Excellence (COE) as "pools of experienced people who are available for the single manager to draw upon for either development/production or sustainment, as the situation warrants" (12: 4). Their organization is left to the center commander's discretion and the single manager's needs (12: 4).

AFMCP 800-60 does say that IPT members work together at all stages of the project. They are not necessarily co-located or even assigned full time during any or all portions of the program. The team's goal is to be in close enough communication to be able to create a synergy that will allow it to work effectively to optimize the product. In short, the team must consider all aspects of design and support and make trade-offs that maximize the final product, even though the trade-offs may diminish individual components and/or processes (1: 18.6).

Mark Sanborn's Team Building is one of many audio tapes about how to build a team. He makes a clear distinction between a team and a work group. He defines a team as a highly communicative group of nine or ten people with different skills and abilities but with a common purpose, a shared sense of mission, and clearly defined goals (67: 1). He states that creating a team requires an openness to a variety of inputs and ideas from many divergent sources. At the same time, a team must derive its motivation from the mission and its power from its purpose. It is the variety and blending of diversity that is both the blessing and curse of team building; every individual brings both strengths and weaknesses to the team. If the team coalesces properly, it will become a "holographic" entity in which every piece contains the goals, mission, expectations, and ethics of the whole (67: 1).

The role of management is critical in Sanborn's scheme of team building. Management must regard the team as a single entity rather than as a collection of individuals. Management has to let team members know how their individual efforts affect the team's success, how each individual shares the successes of the other members, and how the team impacts the entire organization. Management surrenders authority to become just another member of the team along with employees, customers, and vendors (67: 2).

Other Views of IPT Theory. Interestingly, the literature on the subject of quality organizations sometimes disagrees with Sanborn. DeMarco and Lister primarily agree with Sanborn, although their terminology is different. Their successful teams are "jelled" when they demonstrate a strong sense of identity, a feeling of joint ownership of the product, a low turnover, and a sense of "eliteness" (31: 127). However, DeMarco and Lister make the point that managers must recognize that "teams don't attain goals; people on the teams attain goals;" these authors believe that the purpose of a team is not goal attainment but goal alignment (31: 126).

Kanter ranks individual recognition above group recognition in order to promote self starting and to prevent the individual from feeling lost within the mass of the organization.

> Thus organizations with "cultures of pride" in the company's achievements and in the achievements and abilities of individuals will find themselves more innovative. This is why formal awards and public recognition make a difference -- sometimes less for the person receiving them (who has, after all, finished an achievement) than for the observers in the same company,

- who see that the things they might contribute will be noticed, applauded, and remembered. (50: 183)

Tushman and Romanelli take a middle ground, believing that an individual's levels of satisfaction, frames of reference, and the generation of meaning are all shaped by the team (76: 193). They believe that groups develop shared languages, values, and norms to increase their control of their work environment. That control extends to routinizing and stabilizing work flows, to minimizing the team's dependence on outsiders while maximizing other people's dependence on the team, and to socializing new members on the team (76: 193). Unlike Sanborn, Tushman and Romanelli value teams as forces of stability that reinforce core values and beliefs rather than as promoters of change.

Pre-IWSM Support Equipment Planning

Under the older system of military acquisition management, the functional organizations controlled the processes and focused on optimizing their own efforts rather than emphasizing the success of the overall effort (20: 14). For example, the Program Manager usually assigned responsibility for SE management to the Deputy Program Manager for Logistics (DPML) office. The DPML assigned a SE manager who became the focal point for all SE activity. The contractor(s) and Air Force organizations interacted under the direction and guidance of the SE manager (2: 28-1.A). The art of SE management required the collaboration of contracting, manufacturing, and engineering, as well as logistics, but it was the SE manager alone who had the challenge of planning and

administering the SE program. All SE and all the ancillary equipment required for the SE to continue to operate were the SE manager's responsibility (2: 28-1.C).

The SE manager began by tailoring the Computer Supported Network Analysis System (CSNAS) model to fit his/her individual program (2: 28-6.B). CSNAS generated a generic SE network containing tasks and task times that normally occurred during the acquisition process. The SE manager combined the inputs from the applicable functional offices, users, and the contractor(s) to develop task times and milestones. From these inputs, CSNAS computed slack times and the critical path and also output flow charts and milestone charts. In addition, CSNAS allowed the modification of task start and end dates to comply with the changes and "what if" scenarios requested by the Program Manager (5: 1).

Pre-IWSM SERD Processing

The formal acquisition process started with the development, via the Logistics Support Analysis (LSA) 070 report (an extract of the logistics support analysis report "E" (LSAR-E)), of a preliminary support equipment requirements document (SERD) which contained support equipment recommendation data (SERD*) (15: 2). Before formal SERDs were submitted, the logistics support analysis report "E" (LSAR-E) data was reviewed by representatives from all Air Force (AF) commands involved. This pre-SERD review was designed to eliminate the processing of unnecessary SERDs and to improve SERD quality (18: 987). The participants were to take into account the functional description of the maintenance requirements as well as the requirements dictated by the

maintenance concept; they were to review preliminary designs and the estimated costs (both recurring and non-recurring) for designing, developing, manufacturing and supporting the proposed SE (2: 28-4.B). Those SERD*s that survived this first scrub were formally submitted as SERDs in accordance with the format specified by the Contract Data Requirements List (CDRL) (2: 28-4.A).

Using a computer system, Support Equipment Acquisition Management System (SEAMS), the SE manager was able to access the automated Military Handbook (MIL-HDBK-300) Standardization Technical Information File (TIF) of Support Equipment, and identify SE items authorized for acquisition and available to customers for use, such as Modular Automatic Test Equipment (MATE), AF munitions handling equipment, the AF Standard and Preferred Items List (SIL/PIL), and Standard Tools (hand tools) for Aeronautical Maintenance (STAM & STAM2) (2: 28-6.D). However, SEAMS neither identified the SE items being developed by other program offices, nor suggested commercially available SE with the potential to satisfy system requirements. Screening via any non-SEAMS source had to be performed manually. Reviews of the tables of allowance (TA) and other applicable equipment lists were also manual tasks (2: 28-3.C.; 15: 2-3). The SERD review process was complex; the contractor submitted the SERD to the SPO, who passed it to the Air Logistics Center (ALC) responsible for sustainment of the end item. The ALC distributed it to the using commands (MAJCOM), the inventory manager (IM), and the TA monitor(s) at Warner Robins ALC (WR-ALC). Each of those organizations reviewed it and returned comments and/or signatures to the responsible ALC. The ALC consolidated the comments and/or signatures and forwarded them to the

SPO. The SPO then worked with the contractor to finalize the SERD. The TA monitor(s) notified the IM and the MAJCOMs when the SE had been added to the TA. Figure 2 graphically shows the flow of information during the SERD process.

All SERDs were to be submitted prior to the overall weapon system's critical design review (CDR) in order to allow sufficient time for the SE to be acquired and allocated to the operating bases and depot(s) to support initial deployment (2: 28-4.C).

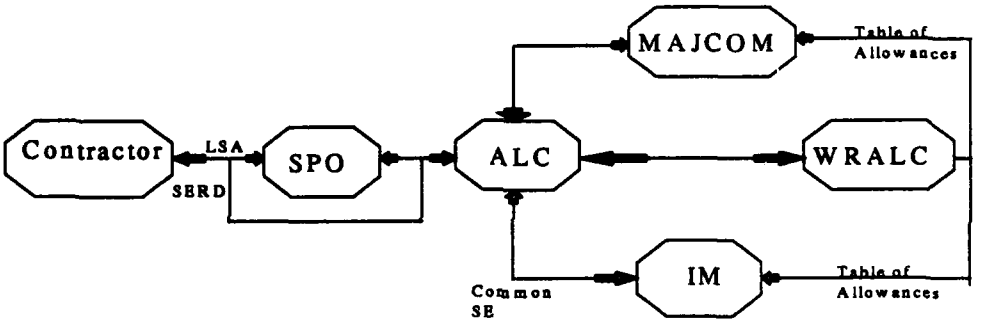


Figure 2
Information Flow During SERD Processing

Pre-IWSM Configuration Control Board (CCB)

After review by both the ALCs and the SPO at Wright-Patterson AFB, the packages were approved for further processing by the Configuration Control Board (CCB). The CCB was the sole agency responsible for approving changes to the configuration baseline (32: 3.e.(1)(b)). Membership on the board included representatives

from the appropriate functional activities, training, and the using organizations (32: 3.e.(1)(a)). Generally, the ALC was present at all CCB meetings via teleconferencing or video-teleconferencing.

Processing a SERD included tasks such as adding items to the applicable Tables of Allowance (TA), cataloging, provisioning, and incorporating the new SE into the Air Force Equipment Management System (AFEMS) (15: 5). If the item was not found in either the Air Force or DoD inventories and was not believed to be commercially available, the CCB authorized the contractor to prepare an Engineering Change Proposal (ECP) to develop the detailed drawings and/or a procurement package. This was done through the submission, by the government, of an Advanced Change Study Notice (ACSN). The SE manager was tasked with coordinating the preparation of the ACSN to ensure that all of the functional concerns and ILS areas were addressed.

Pre-IWSM Engineering Change Proposal (ECP) Processing

The ACSN provided the contractor with the money and contractual authority to prepare an engineering change proposal (ECP). The ECP was expected to address the schedule, costs, and risks; and all the ILS elements involved in changes to the system, related systems, and the support equipment. If the ECP was approved and fell within the scope of the contract, the CCB authorized the contractor to proceed. If it fell outside the scope of the contract, the CCB tasked the SE manager to coordinate and prepare a statement of work (SOW) as the basis for further contractual action.

ECP evaluation and approval by the CCB was not always followed by an award to the prime contractor. The Air Force sometimes competed these packages as Small or Disadvantaged Business (8(a)) Set-Asides, authorized local manufacture, or went directly to the sub-contractors. If the contract was not awarded to the prime contractor, it became necessary to designate an integration contractor who was expected to evaluate all related ECPs on both the weapon system and other pieces of support equipment to ensure that the various components would all match in form and fit and be calibrated to the same scales. The integration contractor was also responsible for assisting the Air Force in developing and supervising testing when the SE was ready for delivery. In all these situations, there was a need to develop a Statement of Work (SOW) around the ECP package; it was the responsibility of the SE manager to incorporate all the ILS elements that applied and to see that the Integrated Logistics Support Plan (ILSP) and LSA were updated accordingly (68: 28-6.B).

Problems in Support Equipment Acquisition Planning

It is important to offer a brief overview of the problems endemic to all SE acquisitions. SE has a long tradition of being the most easily deferred of the ILS elements (68: 3). This "disconnect" between design and logistics support planning is not unique to military organizations.

> The past has been replete with instances where these [ILS] elements have not been addressed until the prime mission-oriented segments of the system have been developed and the design configuration has been established as being *fixed*. This practice of considering logistic support 'after the fact' has been costly -- with the prime equipment lacking in the design for supportability, and the various elements of support not being compatible

> with the prime equipment or with each other. In addition, many of the necessary elements of logistic support have not been available on a timely basis; that is, items were delivered either too early or too late. (24: 2)

There are a number of reasons for this. Many of the problems stem from the fact that support equipment requirements are highly dependent upon the final configuration of the supported item (43: 91). Even the most minor change in system design usually requires a support equipment change. Design instability of the weapon system often makes it impossible to identify support equipment requirements early enough to develop the support equipment in time to have it ready at initial weapon system deployment (19: 13).

Another problem is a lack of management attention, since acquisition programs have traditionally been graded upon their ability to field the end item, not the ability to sustain it. DeGruccio and Lindsey (1989) examined support equipment for the F100 engine and found "a distinct lack of management emphasis on support equipment. This lack of management emphasis leads to and is compounded by a further proliferation of equipment which results in an extremely high cost and low utility rate relationship" (30: 1).

Finally, if adequate SE for organic maintenance was not in place when the weapon system was ready for initial deployment, the customers' needs for maintenance were satisfied by interim contractor support (ICS). In the past it was faster to get funding to extend ICS than it was to obtain additional support equipment funds (68: 55-56). So widespread was the problem that in 1987 General Randolph, as AFSC/CC, wrote,

> Program directors are not authorized to unilaterally make decisions which result in the fielding of weapon systems that are not fully supported for the purpose of preserving prime mission equipment schedules or funding. When faced with insufficient time or funds to field a fully supported weapon system, they will develop options in concert with the using and supporting commands, and present those options to the appropriate level to

> achieve resolution. For any options which increase the requirement for Interim Contractor Support (ICS), the concepts of Assured Systems Availability (ASA) will be applied to incentivize earliest practical organic capability. (68: 82)

Problems in SERD Processing

Assuming that funding was available and SERD packages were submitted for review in a timely manner, the next set of major challenges came during the analysis process (18: 340). Poor analysis sometimes introduced unnecessary or overly complex SE (18: 541). The Automated Lessons Learned Capture and Retrieval System (ALLCARS) has several entries documenting cases of equipment that duplicated existing functions or which was rarely used after acquisition. Parallel development of a capability in multiple programs is not uncommon because SEAMS and the TIF do not contain SE that is currently under development (79).

Because most SERD packages were not produced in a standard format, reviewing the packages was a complicated task. Also, there was no system to match later modifications to the original packages. In fact, there was often no notification of such modifications forwarded to the ALC item management and provisioning offices or the Cataloging and Standardization Center (CASC) (68: 5).

Problems with SE Acquisition Breakouts

When the SE package reached the ECP stage, the decision to break out components for acquisition from other sources sometimes failed to recognize the

additional manpower requirements within the SPO. Management overlooked the need for engineers, logisticians, and contracting personnel to support the breakout process. One ALLCARS entry states,

> In component breakout, the government assumes responsibility...for schedule compliance, hardware quality, and other requirements. These responsibilities involve a heavy workload, but can result in a major savings. However, the additional personnel needed to perform the work typically are not available. The government is therefore unable to accept acquisition management responsibilities, so the potential savings are lost. (18: 962)

Another breakout problem came when the recommendation to manufacture SE locally did not take into account local capabilities and resources. The decision for the AF to assume responsibility for these items seemed to be a good one, except for the fact that the activity involved was not directly consulted as to its resources and capabilities. Even though items involved were not technically complex, the lack of special tooling, as well as the other resources necessary to do the job, put an undue burden on the activity required to perform as a manufacturer; it overtaxed the available manpower and manufacturing capabilities (18: 1457).

Previous Research on Support Equipment

Long before IWSM, Shipp, Clellen, and Danielson (1958) included an excerpt from the Congressional Record of 1955 which quoted the findings of Dr. Carl L. Frederick's investigation, at the behest of the Air Force, of electronic SE. Dr. Frederick's group recommended eliminating duplicative and overlapping equipment, systematizing the classification and technical descriptions of available equipment, making such descriptions

easily available to potential users as well as contractors, increasing the use factors of various equipment, and simplifying the procurement and supply cycles of logistics personnel (70: 59).

Shipp, Clellen, and Danielson found that both AMC and ARDC were being swamped by submissions of SE and that this situation "was resulting in the Air Force's virtual abdication of management control in this area" (70: 31). Those researchers wrote about the "many avenues of improvement" that AMC and ARDC were exploring to reduce the problems of obtaining SE in a timely fashion (70: 3). Among those avenues was a change to MCP 71-650 that required consolidated lists to be submitted every 90 days throughout the development and production life of the basic contract. The lists were intended to provide additional time for a proper evaluations so that complete reviews could be conducted to determine if standard items were available (70: 33).

Two years later Goedeking, Chrysler, and Smith (1960) pointed out that "the cost of Ground Support Equipment relative to the basic weapon is becoming the major expense category." They found no consistency in procedures among organizations acquiring SE and recommended standardization of procedures for determining the quantities of ground support equipment which are needed (43: 5, 8).

The Assistant Secretary of the Air Force for Research, Development and Logistics requested the formation of a Support Equipment Acquisition Review (SEAR) in 1984 for an in-depth study of the entire spectrum of SE acquisition (73: 1). The SEAR concluded that the $1.5 billion cumulative shortage of SE was not impacting the accomplishment of

the peacetime mission -- thanks to extensive workarounds and personal ingenuity (73: 1). The report cited nineteen issues and made over one hundred recommendations.

In response to the creation of the Air Force Office of Support Equipment Management (AFOSEM), the San Antonio Management Analysis Group (SAMAG) in 1987-88 did a study on the management of SE and the acquisition process. Because SA-ALC managed 52 percent of the SE inventory in the Air Force, management was particularly interested in the progress being made toward addressing the issues raised by the SEAR (68: ii). The final report consolidated its findings under four broad issues: the lack of a central AF manager for SE; the outdated, off-line groupings of independent computer systems used to manage SE; the difficulty in accessing SE management data; and the incompatibility of management philosophy, directives, systems, and the acquisition "environment" (68: 25).

In 1989, DeGruccio and Lindsey examined support equipment for the F100 engine. In the same year, Bassett's thesis research concentrated on the process by which contractors' support equipment recommendations were reviewed and approved. Bassett found that the SERD review and approval process took an average of about six months, more than twice as long as the 75 days allowed by Air Force policy. Delays were occurring at all phases of the review process (19: 75-76).

In a 1991-1992 study of the pilot IWSM implementation, Dalrymple and Pietraszuk interviewed managers and functionals in the LANTIRN, FPS-124, and Joint-Stars programs (three of the pilot programs for IWSM), plus members of the F-16 SPO. While they did not specifically address the area of SE acquisition, they did question the

respondents about the difficulties inherent in the Engineering Change Proposal (ECP) process, an important sub-process in the effort of taking a piece of support equipment from SERD* to contract award. Engineers from the ALC stated loss of autonomy had made them uncomfortable bringing up issues. The engineers complained that they were tasked to focus on specific support issues and their attempts to take a more global interest were discouraged as being duplicative of SPO efforts (29: 150). In addition, the engineers from the ALC were not allowed to participate in the CCB (29: 137). Dalrymple and Pietraszuk concluded that the SPOs and the ALCs needed to implement both an IPT approach and, as stated above, a single joint CCB (29: 78).

In the same year, Williams produced an analysis of the SE acquisition process in the F-16 SPO that does a good job of explaining the relationship of "destabilizers" to acquisition problems. He identified instability as the primary problem in SE acquisition, and identified eleven destabilizers: faulty requirements, strategy disconnects, overly optimistic schedules, poor cost estimates, inadequate skills, reporting requirements, unfulfilled baselines, plan ambiguity, micromanagement, contractor buy-in, and changing budgets (80: 117-121).

Studies of IWSM Implementation

In their 1991-1992 study of the pilot IWSM implementation, Dalrymple and Pietraszuk interviewed program managers and functionals from both the ALCs and the ASC Product Centers at Wright Patterson. The functional disciplines investigated included engineering, contracting, and financial management. The Dalrymple and

Pietraszuk thesis, while not a quantitative analysis of the contracting process, frequently referenced quantitative, as well as qualitative, changes. The authors concluded that there was a need for more emphasis on pre-acquisition planning at the program and a need to increase communications among organizations and considered the need to improve the process. Their recommendations included the implementation of both an IPT management approach and a single joint Configuration Control Board (CCB) (29: 76-78). They pointed out that IWSM may not necessitate changes in all functional areas. In some cases "results of process analyses indicated that no changes were needed" (29: 79).

Two studies in 1993 also explored components of IWSM (65; 77). Neither of these studies addressed IWSM or SE directly, but addressed one aspect of the implementation of IWSM -- the Integrated Product Team (IPT) -- that has a profound impact upon SE. Wagner and White looked at the F-22 Program and recommended that support personnel be physically separated from the IPTs to which they are assigned. The reasoning was that there was rarely enough manpower to allow for the "dedication" of a functional representative to a single IPT; that functional members need to retain a program-wide perspective and may need to communicate with other functionals; and that providing a complete set of reference materials for each functional area on each team may not be feasible (77: 5-3).

Paul and Stull surveyed an unidentified SPO that was organized as a matrix, using separate functional departments, prior to reorganizing into IPTs (65: 26). The SPO had measured members' attitudes and overall performance via survey every six months. The authors used secondary data from the SPO's surveys to create the longitudinal study that

was the basis of their thesis. These SPO surveys showed no significant differences in attitudes before and after the implementation of IPTs. Based upon their literature review, Paul and Stull interpreted this lack of change in attitudes as the direct result of proper planning and management. Their findings indicated that IPTs are transparent to already-established matrix organizations because the differences between IPTs and the traditional SPO matrix structure are too minor to impact individual attitudes (65: 42-43).

This conclusion raises a serious concern. There is another, equally valid, interpretation of their data: did the SPO really change to Independent Product Teams or merely rename matrices as IPTs? Paul and Stull did not describe the changes to organizational structure which resulted from the implementation of IPTs; therefore the nature and extent of the reorganization is impossible to determine. The danger is that while trying to make the change to the IPT environment transparent to workers, management may have made IPTs virtually invisible. In the following chapters, the researchers will demonstrate how they sought to recognize and explore the extent to which genuine IPTs were operating, rather than matrix organizations masquerading under the name "IPT."

Resources Available to Forestall Problems

Those who work to acquire SE have a number of tools available to assist them in their work. The Acquisition Logistics Toolbox and Index, which predates IWSM and is constantly being updated and expanded, lists the SE management tools (3; 4). Some of

the tools are general in nature, while others provide guidance in specific areas of SE acquisition.

Examples of general tools are the computer-based Support Equipment Acquisition Course, which provides novices with an overall orientation to the SE acquisition process, and the SE Acquisition Guide, which is designed as a general overview of all the forms and procedures required in the acquisition of SE (72; 6). This guide discusses how to use the LSA and SEAMS, how to process a SERD and get it on contract; and explains where SE acquisition fits into an overall system acquisition strategy. The Air Force Acquisition Model (AFAM) provides "greybeard" guidance through all aspects of the acquisition process (11).

There are tools for assistance in specific areas. The Support Equipment Acquisition Model in the Computer Supported Network Analysis System (CSNAS) contributes a great deal of management assistance by generating all the necessary schedules (27). Another tool is the SE Master Planning Guide, which walks personnel through the preparation of an SE master plan that will focus SE acquisition personnel on the short and long term future of SE acquisition management and promises to "provide them with enough of the right kind of information to make intelligent decisions about those acquisitions" (7: 2).

Program Risks Related to IWSM

AFMC Pamphlet 800-60 states: "IWSM provides a framework for doing business at all levels within the command. It is not an organization but a way of looking at

management relationships that encourage change to improve the way we operate" (35: Introduction). This new way of looking at relationships has the potential to dramatically change the dynamics of Air Force acquisition.

Dramatic changes require a transformation of strategy, power, structure and controls. The results of change are not always positive. For example, under IWSM, the functional offices lose clout and visibility over program decisions, and there is the potential that important elements of a program may be devalued because they no longer have powerful advocates. Repeated compromises may be perceived as defeats and reduce the performance of a functional area. Tushman and Romanelli warn:

> If organizational performance is low, inertial forces will be associated with a further decrease in performance as well as an increase in organizational turbulence. This turbulence is reflected in erratic decisions, increases in intra-organizational conflict and political behavior. Prolonged incremental change in support of an inappropriate strategic orientation leads to further crisis (and possibly failure) and to internal pressures to fundamentally change the firm's orientation. (76: 201)

This thesis intends to "take the pulse" of the various functions in order to measure the changes in management relationships since implementation of IWSM.

Risks to IPT Formation and Operation

DeMarco and Lister list seven dangers to the formation and operation of teams. These dangers are defensive management, bureaucracy, physical separation, fragmentation of people's time, quality reduction of the product, artificial deadlines, and clique control. Of these, this thesis focuses on bureaucracy, physical separation, and fragmentation of people's time.

The Chairman and CEO of Martin Marietta, Norman Augustine's formula for failure was on the mind of the creators of IWSM (1: 18.18-20). Some of the elements that he included are germane to any study of the risks to IPT success. These elements are frequent management changes, division of management responsibility among several individuals, creation of many interfaces, focusing on the big picture (while ignoring details), ignoring the user, elimination of independent checks and balances, minimizing managers' latitude for judgment, and failure to delegate (17: I.10).

The Commander's column in the Skywrighter had a letter from an IPT leader who expressed a number of concerns which demonstrated that at least one SPO had poorly prepared for the transition to IPT management. Among the writer's concerns were the legitimacy of the IPT structure in relation to personnel regulations, the lack of supervisory experience and training, and the fact that "many IPT subgroup leaders are far less experienced, less educated, and lower ranked than the fellow workers we must supervise" (60: 3).

Anticipated Impact of IWSM on the SE Acquisition Process

The IWSM Implementation Guide states that there should be surprisingly little change in the contracting process under IWSM (35: 129). During the interviews for the Dalrymple and Pietraszuk study, some of the Product Center and the ALC respondents stated that they anticipated enormous changes in the contracting process (29: 93,94,133). Others respondents agreed with AFMCP 800-60 and could foresee no change at all (29: 132,133,147). The difference in perception about the impact of IWSM occurred

because AFMCP 800-60 defined contracting as the actions of contracting personnel as specified by the Federal Acquisition Regulation (FAR). The definition used by Dalrymple and Pietraszuk incorporated the actions of the IPT in support of the contracting process. Like this current study, the Dalrymple and Pietraszuk study extended to the period preceding the release of the request for proposal (RFP) (29: 52,64,65).

III. Methodology

Overview

This thesis uses a case study approach to focus on the impact of IWSM on the SE acquisition process. This chapter gives an overview of the research strategy, justifies the use of case studies, discusses sample selection, and describes the development of the research instrument, the interview procedure, the data analysis procedure, and limitations of the research design.

Research Strategy

The research effort was divided into two phases. During Phase I, the researchers selected the weapon systems to be included in the study, verified the elements of the SE acquisition process, and ascertained the standard time frames for those elements. The pre-IWSM standard time frames were provided by the Computer Supported Network Analysis System (CSNAS) SE Acquisition model. During Phase II, the researchers conducted structured personal interviews of various functional personnel in the selected organizations, and examined management reports to determine current organizational structures and procedures. The researchers then compared the results of the research with pre-IWSM standards to identify changes, attributable to IWSM implementation, in the SE contracting process and time frames.

Phase I. Four programs, in varying stages of system maturity, were selected for inclusion in the study (see Table 1). Because the population of weapon systems acquiring SE was small, selection was judgmental rather than random. SE acquisition process elements, steps within those elements, and standard time frames were verified by examining existing DoD and Air Force guidance, as well as previous studies and the CSNAS Support Equipment Acquisition Model. The SE acquisition process elements were identified as SERD*, SERD, ECP, and SOW. Using CSNAS, the researchers prepared a simplified baseline flow chart of the SE acquisition process (see Appendix D), to use as a starting point for phase II.

Table 1
Programs Included In This Study

Program	C-17	F-16	F-22	SOF
Acquisition Phase	Production and Deployment	Operation and Support (O&S)	Engineering and Manufacturing Development (EMD)	Modification
Disciplines Interviewed	Configuration Contracting Logistics	Configuration Engineering Logistics	Configuration Contracting Logistics	Engineering Contracting Logistics

Phase II. The researchers interviewed personnel involved in SE acquisition for the selected weapon systems. Whenever possible, the researchers interviewed personnel from each of four major functional areas which contribute to the SE acquisition process: contracting, engineering, configuration management, and logistics (see Table 1). The

interviews focused on the system program office structure, how the function participated in the SE acquisition process, and the problems encountered. In phase II, the researchers also attempted to identify the reasons for differences in the organization and the SE acquisition process from the pre-IWSM process. In order to keep the study objective, the interviews were constructed to avoid questions of opinion about how well IWSM was doing. Instead, the interviews elicited information about the respondents' knowledge of IWSM and explored the differences within each element of the SE contracting process. Follow-up questions were addressed via telephone interviews.

Justification for Case Study Approach

The literature on research methodology suggests five conditions in which the use of a case study approach is appropriate:

> (1) when 'how' or 'why' questions are being posed.
> (2) when the investigator has little control over events.
> (3) when the focus is on contemporary phenomena within some real-life context (82: 20).
> (4) when seeking the full contextual analysis of a limited number of events.
> (5) when seeking insight for problem solving and/or evaluation. (41: 142-143).

This research effort meets all of the above conditions. The objective of this study is to explore how and why SPO organizational structures and procedures have changed since the implementation of IWSM in July 1992 (condition 1). The researchers had no ability to control or manipulate the SPO environment (condition 2). IWSM is a contemporary, evolving management approach (condition 3). The population of weapon systems available for study was small (condition 4). The research was conducted to evaluate the

progress of IWSM implementation and to provide insight into areas where the AFMC IWSM office may need to provide further guidance (condition 5).

Research Instrument Development

Structured personal interviews were selected as being the most appropriate research instrument for a case study. Written questionnaires were considered, but were ruled out because they are less flexible than interviews. Telephone interviews were conducted when personnel to be interviewed were at locations other than Wright Patterson AFB. To determine the current SE acquisition procedures within the SPOs, the researchers chose interviews of moderate depth with each of the functional areas most involved in the SE acquisition process. This approach also supports the analysis necessary to determine whether or not IWSM has significantly impacted SPO procedures. Open-ended questions were chosen to allow respondents freedom in the scope of their answers. This freedom encouraged them to share insights into significant issues which may have been unknown to the researchers during question preparation, thus adding to the depth of the data. The open-ended format also allowed the researchers to somewhat tailor each interview, to omit inapplicable questions, and follow up answers with clarifying questions (41: 338-339).

Question Development

The interview questions were developed to identify the respondent's functional discipline and level of expertise, to elicit a description of the organizational structure, and

to obtain information concerning the current SE acquisition process. The researchers examined the pre-IWSM SE acquisition process and developed questions to elicit information concerning current procedures for each of the critical steps within the process. The interview questions covered the respondent's background and experience level, the office structure, the relationship among the disciplines involved, the guidance and management tools which were available, the systems used for reporting status, each of the SE acquisition process elements, and the respondent's understanding of IWSM. Pilot interviews of experts in the SE acquisition field were conducted to refine the questions and the researchers' interviewing technique. Based on the pilot interviews, the researchers modified and reordered the questions (see Appendix F). The researchers selected a business-like interviewing style, avoiding being either too formal or too informal.

Interview Procedure

Issues regarding technique which were considered included dress, degree of formality, researcher roles, use of clarification and follow-up questions, and respondent motivation. To reduce bias and project a similar image to each respondent, the researchers adopted consistent dress and bearing for all interviews. The researchers chose standard office attire and a semi-formal bearing as projecting the most appropriate image of the nature of the research. The business-like image sustained the credibility and importance of the research, without intimidating the interviewee (41: 324).

The roles of the members of the research team were also consistent. One member of the team acted as the primary interviewer and the other acted as the primary recorder.

The primary interviewer asked most of the interview questions, while the primary data recorder took written notes. Either team member was permitted to ask clarifying or follow-up questions at any time. Clarifying questions were asked to ensure the researchers understood the answer being provided. Follow-up questions were inspired by the interviewee's responses, but were not directly related to the interview questions. The researchers were careful to ensure follow-up questions were relevant, and did not divert the discussion from the main issue.

Recording the Interview

To ensure data was not lost, the interviewers wrote down the responses to the questions as the interview was taking place, then typed up the interview as soon as possible after its completion. The interviews were also tape recorded, with the permission of the interviewees, so the interviewers could refer to the tapes in case their written notes were unclear.

Non-Attribution Statement

Since the data gathered in the interviews were meant to be consolidated into a whole, rather than analyzed individually, the interviewees were guaranteed anonymity. The researchers began each interview with a non-attribution statement (see Appendix E). All notes were destroyed and all tapes of interviews were erased upon completion of the analysis of the research results. This confidentiality reassured the interviewees that they could discuss the topics with freedom from censure, coercion, or pressure (41: 324).

Interviewee Motivation

By arranging interview appointments via telephone conversations, the interviewers were able to ensure the respondents' receptiveness. During the preliminary contact the interviewers established their credentials as serious researchers and convinced the potential interviewees that the research would be beneficial to the Air Force and worth the time invested. This pre-interview contact set the tone for the interviews and reduced the respondents' resistance to answering questions during the actual interviews.

Limitations of Research Design

The research method employed has limitations as well as advantages. Personal and telephone interviews differ in the degree of interaction between the interviewer and the respondent (41: 332). This difference in interview technique may have biased the research by providing less data from ALC personnel than from ASC personnel. Respondents may have felt they had a personal stake in making their organization look good or the interviewers may have inadvertently reacted in ways which indicated the "correct" answer to the respondent. Either of these circumstances may have encouraged the respondents to provide answers as they believed the situation should be, not what actually existed (41: 328-329).

Paraphrasing the responses to the questions as the data were recorded may have resulted in altering the respondents' original intent (41: 328). Synopsizing and consolidating the responses may have exacerbated the alteration. The researchers may have misinterpreted the reasons for differences in the pre-IWSM and current situations.

Other factors, including maturation of the weapon system and lessons learned from other programs, could have contributed to the differences in office structures and procedures.

Data Analysis Procedure

Analysis "involves reducing accumulated data to a manageable size, developing summaries, looking for patterns, and interpreting the findings" (41: 89). The results of the interviews for each program were summarized by discipline, then the summaries were compared to determine similarities and differences in current practices among the various programs. Areas compared included: organizational structure, guidance used, tools used, procedures used, functional interactions, and depth of knowledge of IWSM. The researchers compared the pre-IWSM practices to the current practices, evaluated any differences, and identified the reasons for the differences. The null hypothesis in all phases of analysis was that IWSM made no difference.

Validation of Organizational Structure

In a pure IPT organizational structure, multi-functional teams are organized to accomplish a given goal; each person is a member of only one team; each team is a component of a larger team, and the whole organization is considered a team. Each team within the organization is given authority to make decisions appropriate to its responsibilities (35: 289). Management surrenders authority to become a member of the team along with subordinates, customers, and vendors (67: 2). Because decisions are made at the lowest appropriate level and the number of levels is minimized, the SE

acquisition process is streamlined (35: 277). The IWSM model recommends management relationships for the command, but does not dictate an organizational structure for the centers. Whether or not the centers reorganize as IPTs is up to each center commander (71: 3). The recommended model for all SPOs is organization as IPTs. However, most SPOs are organized in some modification of the pure IPT structure, due to limitations on the numbers of qualified personnel available. The researchers determined the organizational type by the interviewees' descriptions of how the functional disciplines related to one another, rather than by the structure stated by the interviewees.

IV. Results

Introduction

This chapter summarizes the results of the interviews, conducted in phase two of this study, with respect to the research objectives (see Appendix F for the interview questions). The interviews focused on three areas: the system program office structure; how each functional discipline participated in the SE acquisition process; and what problems had been encountered and the reasons for those problems. To present an overview of how implementation of IWSM has affected both the personnel and the process of acquiring SE, this chapter presents a summary of the respondents' answers pertaining to each the step of the process (Appendix G is a synopsis of the answers by functional discipline).

Background of Respondents

All respondents had at least five years of experience in their respective functional disciplines. All were at least journeyman level; some were functional supervisors; some were IPT leads; and some were both functional supervisors and IPT leads.

Office Structure

All SPOs reported that their organizations are IPTs, and considered the users and the ALC personnel to be active, valued team members. The ALC personnel interviewed

agreed with that assessment. SPO personnel (both ASC and ALCs) referred to the ALCsas "SPO-west" (SM-ALC) or "SPO-south" (SA-ALC and WR-ALC). Only one respondent, at ASC, stated he did not feel the ALC was, or wanted to be, part of the team.

Most personnel remain seated in functional groups, and functional supervisors, with few exceptions, are responsible for appraisals and personnel actions. The functionals accept taskings from an IPT leader in the program chain of command, just as they did under the matrix system. Within the functional groupings, each person is assigned to at least one IPT, and every IPT has a named point of contact within each functional grouping. All personnel, even when co-located with an IPT, are required to support multiple teams; one person reported being responsible for supporting fourteen teams. Respondents cited shortages of office space and of personnel in key disciplines, as well as the need for intra-functional interactions, as reasons for not having a pure IPT structure.

In nearly all cases, respondents reported they have little or no difficulty getting support from other organizations within the SPO. Those who reported some difficulty stated they believe the primary reason for the problems is "too much work for too few people."

Based on respondents' descriptions of their organizational structures, the researchers concluded that implementation of IWSM has not changed office structure. The four SPOs, and their ALC counterparts, are still organized as matrices. However, calling the work groups "teams" reduces the perceived divisions between functions and has improved the working relationships among segments of the SPO.

Communications

All respondents agreed communications have improved, since implementation of IWSM, among disciplines within the SPO and between the ASC and ALC portions of the SPO. However, they disagreed about the reasons for the improvement. Some interviewees stated that the improvements would have occurred without any official changes in the Air Force's organization structure, because they were desperately needed. Other interviewees credited various aspects of IWSM for the improvement. IWSM has forced the SPOs to name a person within each discipline to each IPT; even when that person is assigned to multiple IPTs, the other disciplines have a name (person) to contact instead of an office. The ALC respondents stated they feel IWSM has greatly improved communications by making them part of the SE acquisition team, rather than being on the sidelines. The researchers concluded that IWSM has improved communications among the segments of the SPO, and has reduced the attitude that each functional discipline is responsible for only a narrowly defined segment of the process.

Guidance and Tools

Fun[illegible]onal and program guidance cited varied markedly among personnel in all SPOs and all disciplines except contracting. All contracting respondents cited the Federal Acquisition Regulation (FAR) and related regulations. Other respondents depend most heavily on personal experience, either their own or that of other team members. In two SPOs, personnel reported they follow procedures set forth in the acquisition contracts. In only a few instances, personnel reported relying on policy guidance from the Air Force

Office of Support Equipment Management (AFOSEM). Most respondents were not aware that such an office existed.

No one reported using the Support Equipment Master Planning Guide or the Support Equipment Acquisition Guide despite the fact that two SPOs have an SE Acquisition Plan in place that has not been updated in several years (6; 7). The third SPO is working directly with AFOSEM, as part of a PAT team to update the SE acquisition process guidance; the researchers deduced that, in this instance, the information in the guides is being conveyed via personal interaction. The fourth SPO is trying to develop an acquisition plan in order to "document" how they are buying SE in lieu of how they had "planned" to buy SE. The author of this plan was not available for an interview, but in response to inquiry, stated that he is not relying on AFOSEM material.

Respondents also reported using a wide variety of automated tools in the SE acquisition process. After the mandated contracting tools, such as FAR-on-line, the most common government-developed and -maintained tool cited is SEAMS. However, even that is not universal. In fact, one engineer was not even aware that MIL HDBK 300 had been automated and relied on printed copies. None of the interviewees use the tools listed in the Acquisition Logistics Toolbox and Index (3; 4). None of the respondents use CSNAS (27). Most stated they use Microsoft Project© to develop schedules and milestone charts. A few respondents, at the ALCs, use the fourteen-disk Air Force Acquisition Model (AFAM) (11). None of the organizations reported using the Support Equipment Acquisition Course or the Acquisition Logistics Guide to train new personnel (72; 2). One contracting person said that the logisticians on a logistics-led IPT had

repeatedly stated there was no way to become oriented to the acquisition process beyond reading the regulations or asking them questions.

In all SPOs, the logisticians are responsible for monitoring the processing of the SERDs and ECPs. All SPOs regularly review and report on individual and overall SE acquisition status, but status tracking systems vary from SPO to SPO. All the SPOs have some form of SPO-unique tracking system developed and maintained by a contractor. Most respondents have also developed their own personal methods of keeping track of the status of actions which affect them, using products derived from commercial software, or program-unique software developed by contractors. Even if a standard tracking system were developed with the best features of the systems currently in use, existing SPOs would not convert to the new system because of the volume of data requiring conversion.

The researchers concluded that IWSM has not affected the reporting systems used by the SPOs. The researchers were unable to determine if IWSM has affected the functional and program guidance or the automated tools (other than reporting systems) used.

SERD*

Neither contracting nor configuration management personnel are involved with the SERD*. Logisticians and engineers both use the LSAR-E or an equivalent document to verify the requirement for development of new SE prior to preparing an ACSN or a SERD. The SPOs which reported using other documentation stated the LSAR-E was difficult to read and/or did not contain enough information; they have either modified the

LSAR-E to make it more usable, or have replaced it with program-unique reports. The SERD* review is intended to reduce the number of formal SERDs submitted and to improve the quality of those which are submitted, by permitting the team members in all applicable disciplines at ASC, the ALC, and the user, to screen the recommendations prior to preparation of the SERD. The interviewees reported that this process has not changed since the implementation of IWSM, but that it has been expedited by having specified individuals, in every participatory organization, responsible to the team. The researchers concluded that IWSM has not significantly changed the SERD* process, but has slightly shortened the time required.

SERD

In all SPOs, the logisticians are responsible for monitoring the processing of the SERDs. Respondents in all other disciplines consider themselves to be responsible for only the SERD data that is applicable to their discipline. Respondents in three SPOs reported that SERD processing has not changed since the implementation of IWSM. One SPO specifically reported that organizations outside the IPT assign a low priority to SERD responses: this prolongs the process. The fourth SPO accelerates the process by including every signatory on the team, and by developing a "preliminary review document" which standardizes responses from reviewers. The researchers concluded that the IPT concept expedites the SERD process. Extensive SERD* reviews, where performed, also facilitate the SERD review process.

SERD packages are produced in a standard format internal to each SPO, but there is no standardization between SPOs, so reviewing the packages remains a complicated task for those organizations outside the SPO. Also, there is no system to match later modifications to the original packages, although notifications of such modifications are forwarded to the ALC. The ALC is responsible for notifying item management, provisioning offices, and CASC. The ALC personnel insisted that this responsibility is a traditional one and that the process has not significantly changed. The researchers concluded that IWSM has not resolved this problem.

Configuration Control Board (CCB)

Each of the four SPOs has only one overall CCB, which has delegated most support equipment SERD decisions to a lower level. In three of the SPOs, this lower level is a board established specifically for SERDs. The IPTs in those SPOs are responsible for evaluating the requirement, validating the solution, and ensuring that most controversies are resolved before submitting the SERDs to the board. One SPD has delegated responsibility for SE decisions to the SE IPT; these decisions are based on the "iron triangle" of schedule, performance, and budget. Only if a SERD falls outside the triangle is it presented to the CCB. The researchers concluded that IWSM has had a positive impact on the CCB by encouraging the delegation of decisions to lower levels when appropriate.

ACSN and ECP

The two SPOs with capability contracts (see Appendix A) reported they have not yet baselined SE, so have not yet needed Advance Change Study Notices (ACSN) or Engineering Change Proposals (ECP). In another SPO, the IPT leads are responsible for preparing ACSNs, with input from all disciplines. Respondents in the fourth SPO stated that they do not use ACSNs because the SERDs are well enough developed to act as the source document for ECPs; instead they use a letter-format Request for Proposal (RFP) or Request for Quote (RFQ) to elicit ECPs from the contractor.

All disciplines consider reviewing ECPs to be a team effort by the ASC side of the SPO, the ALCs, the users, and the contractors. Each discipline considers itself responsible for ensuring that every ECP, whether on the major end item of the system or on SE, addresses the impacts on other equipment. Even with a team effort, the ACSN/ECP process is cumbersome and lengthy.

In all cases, the respondents reported that their ACSN/ECP procedures have not changed since the implementation of IWSM. This aspect of SE acquisition has always been a team effort. The researchers concluded that IWSM has not impacted the ACSN/ECP process.

Statement of Work (SOW)

In all SPOs, the entire IPT, including the user and the ALC, participates in the preparation and review of any SOW under the direction of the IPT lead or the SE manager. Once the SOW has been completed, normal contracting procedures are

applicable. The researchers were not able to determine if IWSM has improved the SOW process.

Standard vs. Actual Time Frames

All disciplines reported having difficulty meeting standard time frames for completion of SE acquisition process elements. The most frequently mentioned problem area was SERD processing. One respondent commented that the only way to meet the standard time frames would be to cut the non-SPO organizations at the ALC out of the SERD review process completely. Several interviewees stated that response time within their IPT is well within standards, but they have difficulty obtaining timely responses from organizations outside the IPT. They commented that they believe people outside the IPT are less responsive because they feel no personal responsibility for meeting the time frames. One respondent, at an ALC, commented that one of their biggest problems is that the clock starts when the ASC side of the SPO receives the SERD, but the ALC may receive their review copies as much as three weeks later.

Only one SPO reported they had no difficulty meeting the SERD process time limit. Their procedure is to scrub the SERD* and resolve all questions and controversies before allowing the contractor to submit a formal SERD. Once the formal SERD is received, it is a simple matter to obtain signatures from personnel who reviewed the SERD*. This SPO counts only the time after formal SERD submittal, and averages twenty to thirty days.

The researchers concluded that IWSM has not measurably affected the SPOs' ability to meet standard processing times.

Other Comments about IWSM

Most interviewees in management positions lauded IWSM for placing emphasis on teamwork and making the ALC "part of the SPO." However, some respondents expressed the opinion that the wide geographic separation and the differences in the way ASC and the ALCs work prevent their truly being "one team." Generally, respondents reported that IWSM has not significantly changed day-to-day operations, since successful SPOs have always worked as teams with the ALC, the user, and the prime contractor.

Several respondents stated that the process of acquiring and supporting systems has not become seamless; the PMRT mindset still exists. The workload is still being transferred from the acquiring organization to a sustaining organization, although the name "Program Management Responsibility Transfer (PMRT)" has been changed to "consignment" or "workload transfer." The elimination of the formal PMRT procedures has created ambiguity as to when and how responsibility should be transferred. The team concept, which tries to eliminate duplication of effort in the various locations, may have created a vacuum, at the gaining organizations, in some functions which will be needed when the workload is transferred.

Respondents saw several disadvantages to IPTs as they are being implemented. Among the concerns were:

1. Since IPTs require more personnel than functional organizations, manpower cuts would adversely affect the teams' ability to perform.

2. Separating the functionals from their discipline would make it more difficult for them to stay current with the state of the practice in their disciplines. This would lead to a loss of commonality in the practices among the various teams.

3. Supervising the personnel would become more difficult. When functional personnel are co-located in IPTs, the functional supervisor loses the routine familiarity with individuals which is important to making personnel decisions. However, the lead of an IPT composed of multiple functional disciplines does not usually have enough familiarity with each discipline to make intelligent personnel decisions.

The researchers concluded that, while the metamorphosis has begun, the two years since implementation of IWSM have not provided enough time for completion of the cultural revolution which will be required for the Air Force to fully benefit from IWSM.

V. Conclusions and Recommendations

Summary

> And it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new. This coolness arises partly from fear of the opponents, who have the laws on their side, and partly from the incredulity of men, who do not readily believe in new things until they have had a long experience of them. (54: 9)

This study was about change and the impact of change. The researchers examined the support equipment contracting process, from the submittal of the support equipment requirements data (SERD*) through preparation of the statement of work (SOW), to determine the extent of the impact of the implementation of Integrated Weapon Systems Management (IWSM). While the primary focus was on the process, a key to the implementation of any philosophy is how well personnel absorb the new concepts. Some questions were structured to see if "the incredulity of men" and if "all those who have done well under the old conditions" have been converted to the new philosophy of handling the SE acquisition process. This chapter presents the researchers' conclusions and recommendations which resulted from the study.

Conclusions

> In day-to-day management situations, the first instinct, when confronted with a problem, is to hide it or ignore it rather than to face it squarely. ... It is only human nature not to want to admit that you have a

> problem, since admitting to problems is tantamount to confessing failings or weaknesses. ... The worst thing a person can do is to ignore or cover up a problem. (47: 163-164)

This section presents the researchers' conclusions with respect to both progress resulting from IWSM and problems which still exist.

Office Structure. All respondents reported their offices are organized as IPTs; both ALC and ASC personnel reported that they feel that they are operating on the same team under the same management. However, most described matrix-style chains of command and matrix-style interactions among the functional disciplines. These offices are, in reality, matrix organizations renamed "IPTs." The IWSM Model recommends, but does not mandate, the use of IPTs (12: 4). Dalrymple and Pietraszuk (1992) also recommended implementation of an IPT approach, but also advised management to be prepared to accept that IWSM might not result in any changes to a functional area (29: 78, 79). The researchers concluded office structure has not been significantly changed by IWSM. On the other hand, renaming work groups as "IPTs" has positively impacted attitudes toward organizational relationships.

Communications. All respondents in this study agree communications have improved, though they disagree on the reasons. Based on the interviewees' descriptions of the inter-discipline and inter-office interactions, the researchers concluded that the primary reason for the improvement was implementation of IWSM and IPT principles. This was consistent with the findings of Wagner and White (1993), who found indications

of improved communications due to formation of IPTs and extensive use of electronic media (77: 4-10 to 4-13, 5-3 to 5-4).

Guidance and Tools. The researchers found there is no consistency among SPOs in the procedural guidance followed. SE Plans are nonexistent or outdated. Some, but not all, of the divergence in procedures is the result of contractual requirements. Other than the FAR-On-Line, there is no consistency automated tools used. Most respondents used a combination of contractor-developed, program-unique software and personally-developed applications of commercial, off-the-shelf software to develop schedules and track status. This is the same problem identified by the SEAR (1984), and reaffirmed by the SAMAG four years later (73: 75; 68: 43-44). The researchers concluded that IWSM has not affected the guidance and automated tools used. This continued lack of consistency may have disturbing implications for the future.

SERD*. While respondents reported no changes in the SERD* process since the implementation of IWSM, they did state that the pre-SERD review process has been facilitated by having specified individuals as points of contact within the various offices of the SPO. The single SPO participating in intensive LSAR-E scrubs reported a reduction in the variety of SE and improvement in the quality of SERDs. The researchers were unable to verify the origins of the concept of intensive LSAR-E scrubs; these were called for as early as the SEAR report (73: 78). The researchers concluded that IWSM has not significantly changed the SERD* process.

SERD. Respondents in three SPOs reported that SERD processing has not changed since the implementation of IWSM. The fourth SPO accelerates the process by including every signatory on the IPT, and by developing a "preliminary review document" which standardizes responses from reviewers. The researchers concluded that the IPT concept expedites the SERD process. Also, performing extensive SERD* reviews facilitates the SERD review process.

This study found SERD packages are being produced in a standard format internal to each SPO, but there is no standardization among SPOs. There is no system to match later modifications to the original packages. The ALC personnel insisted the process has not significantly changed. The problems identified by the respondents in this study were consistent with the findings of the SAMAG (1988) (68: 5). The researchers found IWSM has not resolved the problem.

Configuration Control Board (CCB). This study found each of the four SPOs has only one overall CCB, which has delegated most SERD decisions to a lower level. In one SPO, the authority is delegated to a support systems IPT, which makes decisions without resorting to any board; in the other three SPOs, the delegated authority rests in a SERD Review Board. Dalrymple and Pietraszuk, in their study of the pilot IWSM implementation, recommended that the SPOs implement a single joint CCB (29: 78). The researchers could not determine if the move to a single CCB was the result of IWSM, but the delegation of authority to a lower level was a direct result of the IWSM philosophy.

ACSN and ECP. In all cases, the respondents reported that their ACSN/ECP procedures have not changed since the implementation of IWSM. This aspect of SE acquisition has always been a team effort. The researchers concluded that IWSM has not impacted the ACSN/ECP process.

Statement of Work (SOW). While all SPOs reported that all functional disciplines participate in the SOW preparation process, the researchers were unable to determine if this was a change from the pre-IWSM process.

Standard vs. Actual Time Frames. All disciplines reported having difficulty meeting standard time frames for completion of SE acquisition process elements. While obstacles were reported at all stages of the acquisition process, the most frequently mentioned problem area was SERD processing.

In this study, the SERD review and approval process routinely exceeds seventy-five days in three of the four SPOs, in spite of continuous efforts to shorten the process. The single exception does not count the time required for scrubbing the SERD*, but counts only the time after formal SERD submittal. A similar inability to meet standard time frames was discussed in the SAMAG report, which quoted an Air Force Audit Agency finding that ninety-two percent of SERD reviews exceeded the seventy-five day standard, and reviews averaged one hundred ninety-nine days (68: 44-45). Bassett found no significant improvement (19: 75-76). The researchers concluded that IWSM has not measurably affected organizations' ability to meet standard processing times.

Process Improvement. IWSM tried to solve the institutionalized problems inherent in joint ventures between two commands by making them one command. Based on the interviews, it seems that IWSM is succeeding in this area. Most functionals, at both ASC and at the ALCs, consider themselves to be part of an overall SPO IPT, and report improved communications and increased cooperation with their geographically-separated team members. Functionals who work with the products of earlier processes generally report being consulted during the development of those products, and are much happier with the results.

The researchers found indications that IWSM does not address some of the traditional sources of SE acquisition problems. For example, IWSM offers no solution to the problem of similar SE being simultaneously developed by two or more SPOs. With SEAMS gone and the Technical Information File (TIF) not yet equipped to assume the role of recording common support equipment, the ALCs face increased reliance on manual processing while coping with manpower cuts (79).

Recommendations for Improvements

> The problem is that the people who create the problem are not directly inconvenienced by it. Thus people are always sensitive to problems (or inconveniences) caused by other people, yet insensitive to the problems and the inconveniences they cause other people. The best way to break the vicious circle of passing the buck from one person to another is for every individual to resolve never to pass on a problem to the next process. (47: 163)

This section presents some recommendations for solving problems at their point of origin, so they do not get passed to the next process.

Training.

1. Personnel: Many personnel, experienced in their own specialties, are not familiar with how those disciplines fit within the overall SE acquisition process. The authors recommend expanded use of the computer-based training available from AFOSEM to familiarize all functional disciplines with the overall SE acquisition process.

2. IPT Leads: As the number of IPTs increases, the percentage led by experienced supervisors will decrease. Therefore management should ensure all team leaders are trained in supervision and team building.

3. Use of Software: All personnel, both journeymen and IPT leads, should be trained in the use of the commercial, off-the-shelf software which the Air Force provides with each computer. While many people are using the word processing, spreadsheet, data bases, and project planning software provided, others do not use current software because they have not been trained in its use and do not know its capabilities. This disparity hampers SPOs in their efforts to take full advantage of the opportunities for paperless communication which modern networked computers provide. Most personnel could significantly expand their use of the current software with a few hours of training.

Software.

1. Standardized Tracking Systems: SPO-unique, contractor-developed software is expensive to maintain and reduces communication among SPOs. When a contract for SPO-unique software is closed out, the data bases are not maintained, and valuable data is

lost. The authors recommend that a standard on-line data system, which incorporates the best features of the systems currently in use, be developed for use in tracking SE acquisition.

2. On-line SERD processing system: A standard, on-line SERD processing system would have many advantages. It would standardize DoD SERD format and expedite review of SERDs A common system would also reduce proliferation of SE by providing Air Force-wide visibility of SE being developed by each SPO.

Organizational Integration. AFMC should continue to emphasize integration of the organizations which formerly comprised the two commands. Integrating the ASC and ALC sides of the SPOs has improved communication between the acquirers and the sustainers. However, a mindset of "us and them" still exists in many areas. Until all personnel consider themselves part of the "AFMC team," this prejudice will continue.

Standard Processing Times. Artificial "standards" for processing times should be eliminated. An unattainable standard is a disincentive to good performance. When personnel know a deadline is impossible to meet, they lose confidence in their leaders, and are not likely to give the project a high priority (41: 137-138). On the other hand, standards which are challenging, yet attainable, provide workers satisfaction for a job well done.

Recommendations for Future Research

This study touched on several related areas which merit further research.

1. Explore utilization of government-produced-and-maintained software. In particular, investigate the cost effectiveness of maintaining software which essentially duplicates the capabilities of commercial, off-the-shelf software.

2. Investigate the impact of IWSM on other ILS elements.

3. Perform follow-on research on the growth of IPTs to see if the increased cooperation reported by the SPOs continues beyond the transition period.

4. Compare the variety of SE procured under the "capability" contracts with that procured under other types of system acquisition contracts.

5. Investigate the reasons for the low utilization of the Acquisition Logistics Toolbox and Index.

6. Study the feasibility of co-locating the acquisition and sustainment functions of the SPO.

Appendix A: Final Definitions

Advance Change Study Notice	Government generated document requesting an engineering change proposal (ECP) from the contractor.
AFMCP 800-60	IWSM Implementation Guide
Air Logistics Center	OC-ALC at Tinker AFB OK, OO-ALC at Hill AFB UT, SA-ALC at Kelly AFB TX, SM-ALC at McClellan AFB CA, and WR-ALC at Robins AFB GA.
Ancillary Equipment	Equipment required to support and/or maintain an end item. Generally applies to support equipment for support equipment.
CAMS/REMIS	A maintenance computation system.
Capability Contract	A contract which calls for delivery of a weapon system operational capability, including the major end item and the equipment required for its operation and maintenance, rather than contracting for individual items.
Commodity Management	Technical and managerial practices for items, subsystems, and systems with common characteristics and applications that are aggregated for management by a single organization (1: 18.11).
Common Sense Approach	People are to be given a goal and not an answer. Things should be done right, not just because "this is the way it has always been done."
Configuration	A complete description of both the functional and physical characteristics of an item, describing the hardware, firmware, and software to a level of detail required for fabrication, testing, acceptance, operation, maintenance, and logistical support (21:177).
Configuration Control Board	The sole agency responsible for approving changes to the configuration baseline. This includes engineering change proposals, deviations, waivers, advance change study notices, and any other change documents for any configuration item (32: Part 9).
Core Processes	The critical processes of IWSM: Product Management, Requirements, Systems Engineering/Configuration Management, Financial Management, contracting, Technology Master Process, Logistics, and Test & Evaluation.

Cradle to Grave	"The single manager is responsible for all product decisions from a life cycle perspective. This involvement in the program starts not later than the Milestone I decision and continues until the product is canceled or retired from the inventory" (35: 12).
Cultural Change	The move from a functional focus to one based on products and multi-disciplined teams.
Empowered People	Just as the single manager is responsible for all aspects of his/her program, he/she is to delegate authority and responsibility to the lowest level possible and to authorize the necessary resources. This allows for more timely and precise decisions based upon a more timely and precise level of detail.
End Item	Prime Item. Highest assembly created from a group of components and assemblies.
Functional Organization	Organization based upon similar professional backgrounds, such as engineering, logistics, or contracting.
Gold Standards	Best Practices. Functionals are to strive to optimize products even when this may make it necessary to sub optimize their own processes (35: 17).
Integrated Logistic Support	"A composite of the elements necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle" (23: 16).
Integrated Logistic Support Elements	Support equipment, supply support, maintenance planning, manpower and personnel, technical data, training, computer resources, data interface, facilities, and packaging, handling, and transportation.
Integrated Product Team	A multi-disciplinary team which manages and integrates critical processes; the goal is to have the right people in the right place at the right team to make the right decisions (28: 17).
Integrated Weapon System Management	"Empowering a single manager with authority over the widest range of military system program decisions and resources to satisfy customer requirements throughout the life cycle of that military system" (35: 10).
Integration	The process of interfacing the various technical/functional activities to produce a complex system. This includes physical mating of hardware as testing to ensure software compatibility within the system (21: 179).
Kit Proofing	The process of performing a sample modification of a system to verify the instructions and parts included in the modification kit.

Major (Weapon) System	A system that is (1) critical to fulfilling an agency mission, (2) entails the allocation of relatively large resources, and (3) warrants special management attention (59: 3).
Material Group	A grouping of like products that receive consolidated management for sustainment largely for reasons of economy of scale and specialization of technical/ engineering expertise. Normally these groupings do not have any ongoing development efforts (35: 10).
Matrix Organization	A part of organization theory: a project-management concept which cuts across functional lines to concentrate responsibility for accomplishment upon a project manager and views activities as an integrated totality (81: 489).
MIL-HDBK-300	Detailed Air Force record of each piece of aircraft, space system, and missile support equipment. Previously automated as the central module for SEAMS. Not to be maintained as part of the TIF and accessible under the FED LOG.
Military Program Management	Framework processes that, along with the project management functions, form the foundation of the theory and practice of project management (1: 18.5).
Pre-acquisition Planning	The period prior to the release of the RFP. This is when the statement of work is prepared and the acquisition strategy is determined.
Product	AFMC products are the organization's deliverables. These include, but are not limited to, technology, hardware, software, programmed depot maintenance, repair of line replaceable units, patient care, processes, and policy (37: 6).
Product Focus	In all aspects of IWSM and within all elements, the ultimate test is to be, "Is the customer satisfied?"
Product Group	A grouping of similar products in all life cycle phases that are characterized by an on-going development requirement as well as a much larger cumulative sustainment effort (35: 10).
Program Management Responsibility Transfer	A formal process by which AFSC handed off all responsibility and documentation for a given weapon system to AFLC.
Scope of Contract	"It includes whatever performance was specified in the contract and should be regarded as having been fairly and reasonably within the contemplation of the parties when the contract was entered into" (21: 178).

Seamless Process	The critical processes are integrated across the product life cycle and are designed to take advantage of all the talent available. There are to be no barriers across core processes, organizations, locations, or program phases.
Single Face to the User	"A single manager is empowered with the maximum authority over the widest range of program decisions and resources to satisfy customer's requirements throughout the system/product/material life cycle. This gives the user a single individual [to] address any issues that need to be worked to ensure our war fighters are supported" (35: 12).
STAM & STAM2	AF hand tools or Standard Tools for Aeronautical Maintenance.
Supplemental Agreement	"A bilateral written modification to an existing contract which sets forth contractual adjustments negotiated by the parties regarding price, performance, and/or other facets of the contract" (21: 182).
Support Equipment	All equipment (mobile or fixed) required to support the operation and maintenance of the system. This includes associated multiuse end items, special condition monitoring equipment, and tools. In addition, servicing, handling, and maintenance equipment, such as maintenance stands, metrology and calibration equipment, diagnostic and checkout equipment, test equipment, and automatic test equipment, all fall into this category (55: 1.8; 24: 12).
Support Equipment Acquisition Management System	A computer system composed of six modules (MIL-HDBK-300, MMHE, MATE, SIL/PIL, STAM & STAM2, and Diesel Engine Handbook). Dissolved in 1994 with first two modules going to TIF and remainder returning to ALCs. Its exclusive advantages were its on-line/real-time availability to both DoD and contractors; the capability to search records by specifying characteristics; and its ability to maintain and display line drawings (79).
Support Equipment Recommendation Data (SERD*)	The submission of the LSAR-E that is the basis of the Support Equipment Requirements Document. Before the formal submission of the SERD the government has the option of reviewing the data to eliminate the processing of unnecessary SERDs.
Support Equipment Requirements Document	The formal submission of SE requirements. It is submitted in accordance with the format specified by the Contract Data Requirements List (CDRL).

Technical Information File	Part of the DoD Total Item Record (TIR). DoD standard cataloging system maintained by Cataloging and Standardization Center (CASC) as a subsidiary of Defense Logistics Agency (DLA) out of Battle Creek MI. Absorbing some of the information and responsibilities previously contained in SEAMS (79).
Total Quality Air Force	IWSM has the commitment and involvement of the senior leadership of AFMC and the Air Force who actively try to create an environment conducive to the basic concepts of Total Quality Management (TQM). That is, an environment that inspires trust, team work, continuous improvement, and customer focus (35: 12).
Weapon System	Also called "Military System" or "System." A discrete, stand-alone system or collection of systems and related resources which, in conjunction with user support and operation, provide a capability to accomplish a specific military mission.

Appendix B: Acronyms

ACSN	Advance Contractor Support Notice
AFAE	Air Force Acquisition Executive
AFAM	Air Force Acquisition Model
AFEMS	Air Force Equipment Management System
AFIT	Air Force Institute of Technology
AFLC	Air Force Logistics Command
AFMC	Air Force Materiel Command
AFOSEM	Air Force Office of Support Equipment Management
AFR	Air Force Regulation
AFSC	Air Force Systems Command
ALC	Air Logistics Center
ALG	Acquisition Logistics Guide
ALLCARS	Automated Lessons Learned Capture and Retrieval System
AMC	Air Material Command
APB	Acquisition Program Baseline
ARDC	Air Research and Development Command
ASA	Assured Systems Availability
ASC	Aeronautical Systems Center
ASD	Air Force System Division at Wright-Patterson AFB OH
CASC	Cataloging and Standardization Center
CCB	Configuration Control Board
CCP	Contract Change Package
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CSNAS	Computer Supported Network Analysis System
DPML	Deputy Program Manager for Logistics
ECP	Engineering Change Package
FAR	Federal Acquisition Regulation
GFE	Government Furnished Equipment
ICS	Interim Contractor Support
ICWG	Interface Control Working Group
ILS	Integrated Logistics Support
ILS	Integrated Logistics Support
ILSP	Integrated Logistics Support Plan
IPD	Integrated Product Development
IPR	Interim Program Review
IPT	Integrated Product Team

IWSM	Integrated Weapon System Management
LANTIRN	Low Altitude Navigation and Targeting Infrared System for Night
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
MATE	Modular Automated Test Equipment
MCP	Military Change Proposal
MMHE	Munitions Model Handling Equipment
MOA	Memorandum of Agreement
MPM	Military Program Management
O&I	Operations and Intermediate (level of maintenance)
OC-ALC	Oklahoma City Air Logistics Center
OI	Operating Instruction
OO-ALC	Ogden Air Logistics Center
PAT	Process Action Team
PEO	Program Executive Officer
REMIS	Reliability and Maintainability Information System
RFP	Request for Proposal
RFQ	Request for Quote
ROM	Rough Order of Magnitude
SE	Support Equipment
SA-ALC	San Antonio Air Logistics Center
SEAMS	Support Equipment Acquisition Management System
SEMCB	Support Equipment Management Control Board (C-17)
SERD	Support Equipment Requirements Document
SERD*	Support Equipment Recommendation Data
SIL/PIL	Standard and Preferred Items List
SM-ALC	Sacramento Air Logistics Center
SOW	Statement of Work
SPD	System Program Director
SPO	System Program Office
TA	Table of Allowances
TIF	Technical Information File
TIR	Total Item Record
TQ	Total Quality Air Force
TQM	Total Quality Management
WR-ALC	Warner Robins Air Logistics Center
WSMP	Weapon System Master Plan

Appendix C: IWSM Pilot Programs

Planned IWSM Pilot Programs

	Group 1	
Global Positioning System	E-8 Joint-STARS	B-1B
Life Support Systems	AGM-65 Maverick	F-15
	Group 2	
F-111	FPS-124 Ground Based Radar	E-3 AWACS
Electronic Warfare	LANTIRN	
	Group 3	
ICBM	Automated Test Equipment	F-16
B-2	F-22 Advanced Tactical Fighter	

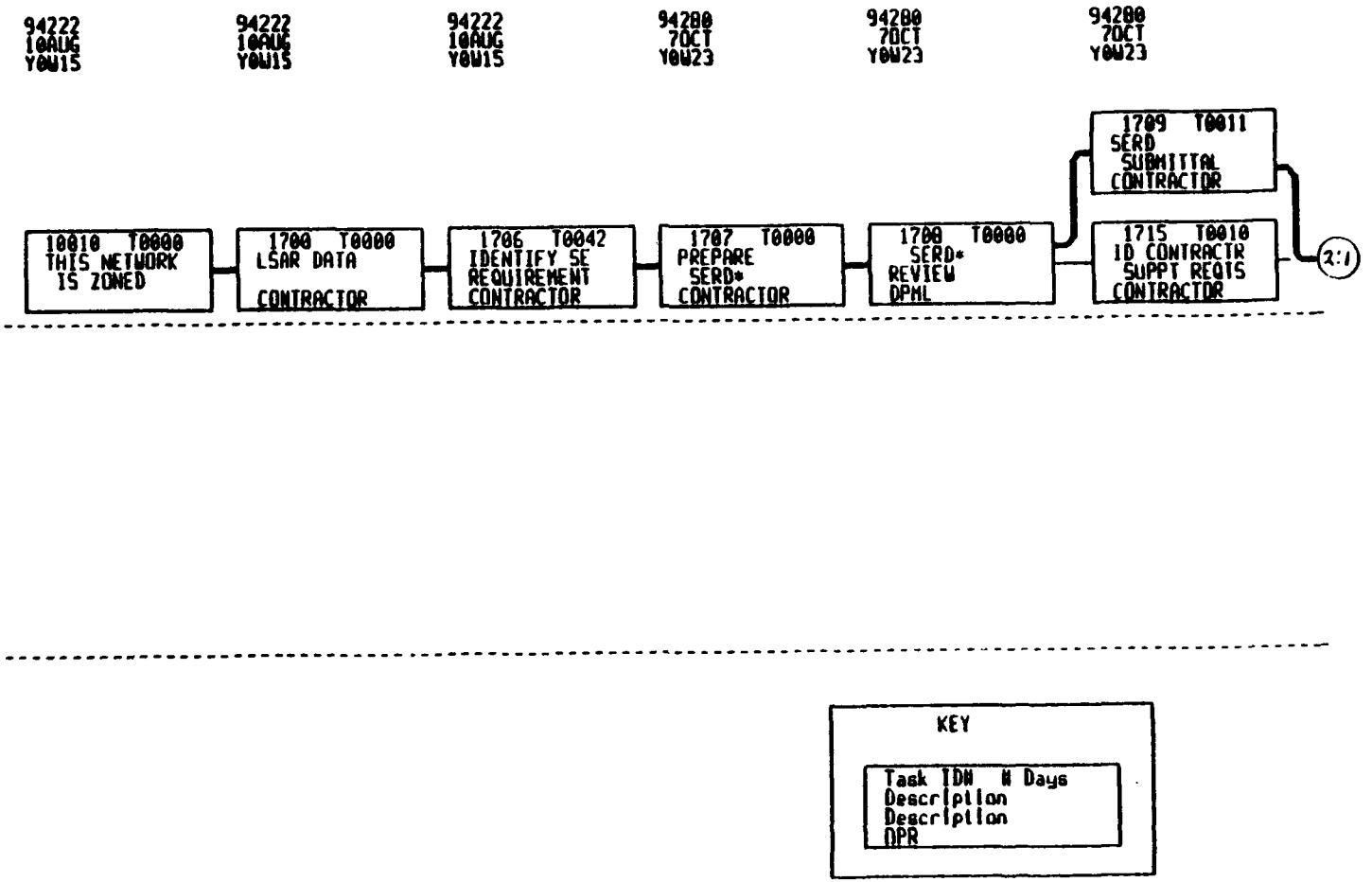
(42: 64)

Actual IWSM Pilot Programs

	Group 1	
Global Positioning System	E-8 Joint-STARS	B-1B
Life Support Systems	AGM-65 maverick	F-15
	Group 2	
F-111	FPS-124 Ground Based Radar	E-3 AWACS
Electronic Warfare	LANTIRN	
	Group 3	
ICBM	Automated Test Equipment	F-16
B-2	F-22 Advanced Tactical Fighter	
	Group 4	
Scope Command	IBIDDS	WCCS
CAS	CAMS/REMIS	

(29: 17)

Appendix D: Simplified CSNAS SE Acquisition Model



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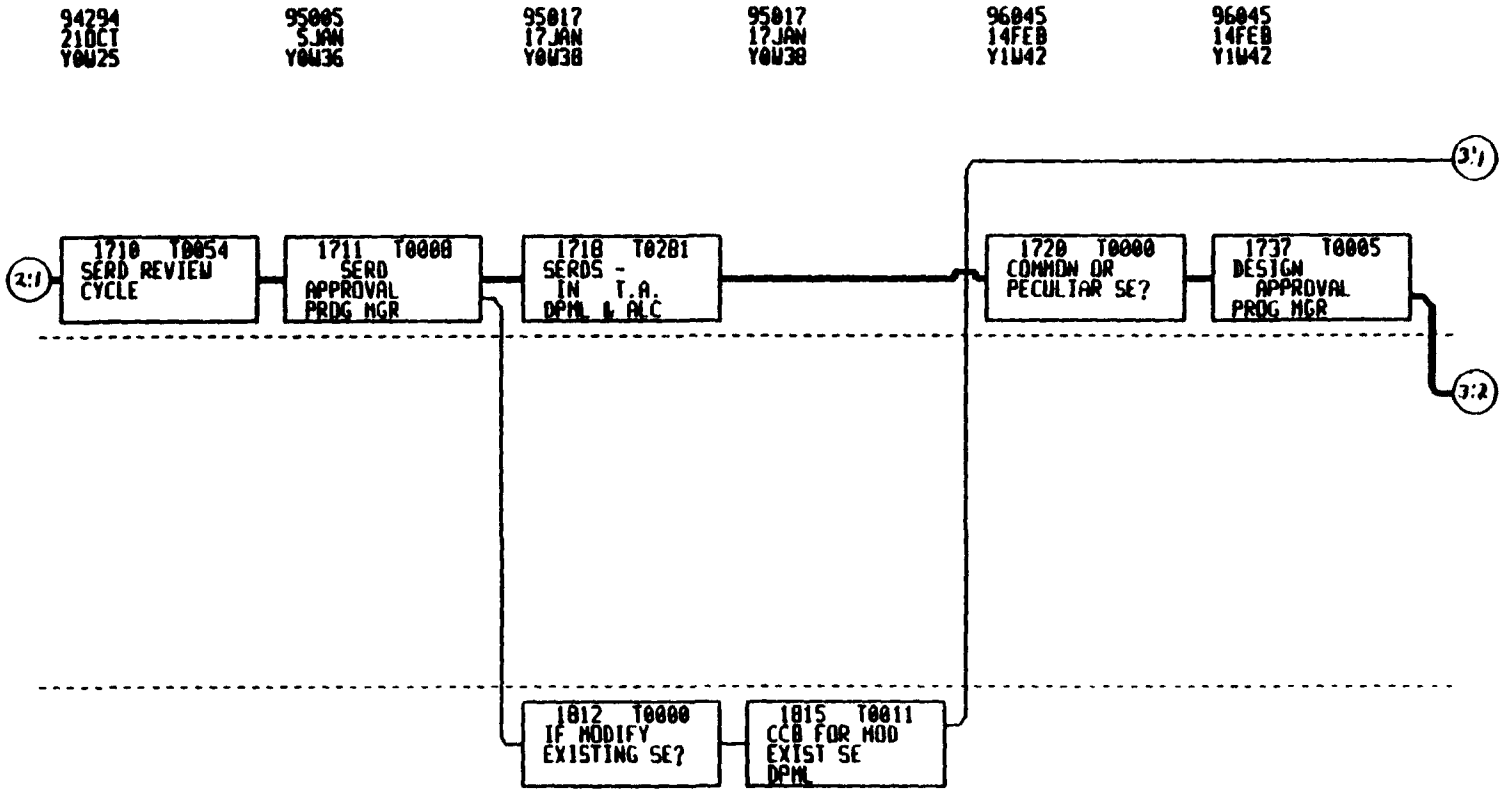

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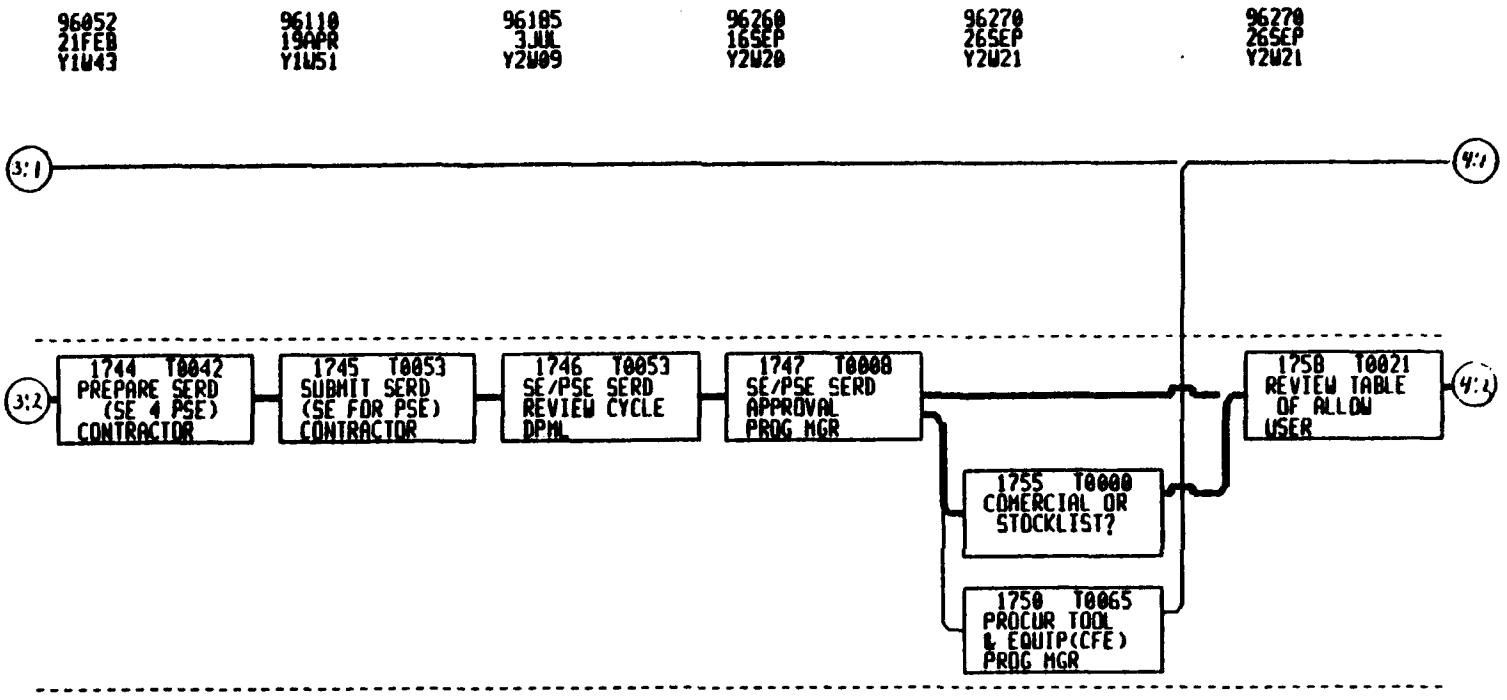
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CONTRACTOR
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(SE FOR PSE)
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SE/PSE SERD
APPROVAL
PROG MGR
1755 T0000
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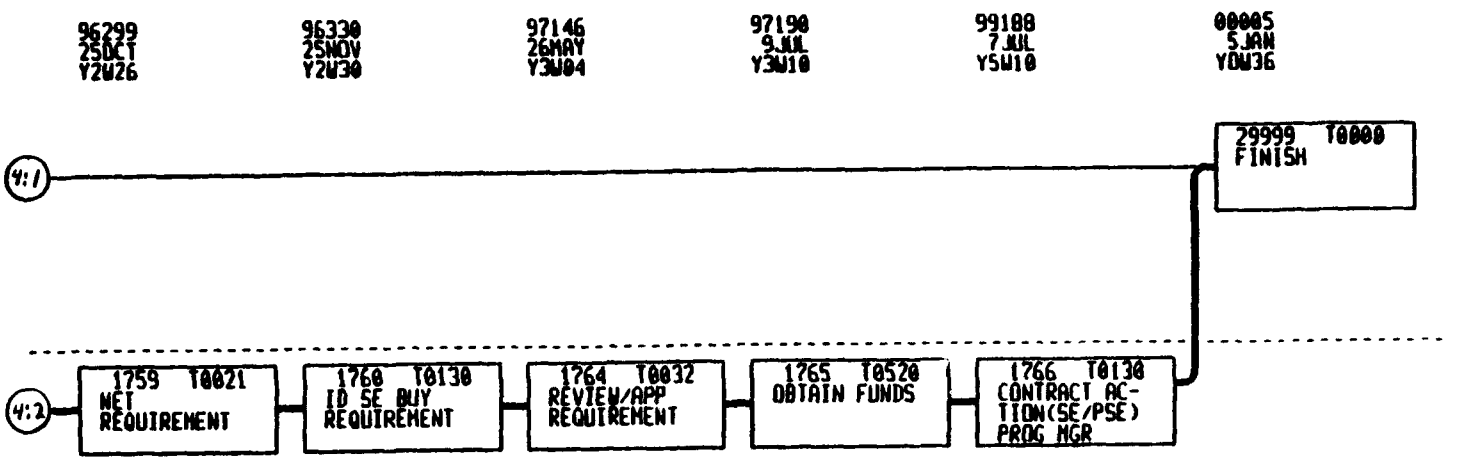

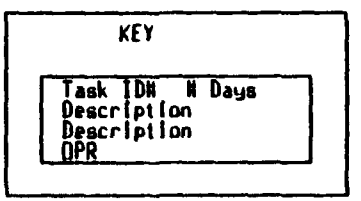

Date: 8/ 9/1994 Section: 1- 4 of 1- 4 CORONADO, BETTY & JANE KWIECINSKI Multipliers: 0.000/1.000 File: A:\SEDASIC.out

Appendix E: Non-Attribution Statement

This interview is a part of our thesis research and academic non-attribution applies. Neither your name nor any other distinguishing characteristic will be used which might allow someone to identify your individual response. Please answer as honestly as possible and feel free to elaborate on any response.

We would like your permission to tape this interview so that we can both speed the process and verify the accuracy of our notes. Both the tape and our notes are for research only, and will be destroyed upon completion of our analysis.

Appendix F: Interview Questions

DATE/TIME: _____
INTERVIEWEE NAME: _____
ORGANIZATION SYMBOL: _____
ORGANIZATION DESCRIPTION: _____
INTERVIEWEE'S POSITION TITLE: _____
INTERVIEWEE'S FUNCTION: _____
PHONE NUMBER: _____

Background Questions

1. What is your length of Experience?
    A. Years, months in this program?
    B. Years, months in this kind of job (within government)?
    C. Related experience(s) from outside government?

2. How is your office organized?
    A. Functional (lateral)
    B. IPT (vertical)
    C. Combination (matrix)

3. How was office structure determined?

4. Which disciplines should be represented?

5. Which disciplines are represented?

6. Are those disciplines not represented in the office accessible?

Questions About the Process

8. What guidance do you have to steer you through the Support Equipment Contracting Process?

9. Are you aware of Air Force Office of Support Equipment Management (AFOSEM)?
    (If not, skip to question 11.)

10. To what extent has AFOSEM been involved in your support equipment acquisition process?

11. What tools do you use to help you in the SECP?

12. Are you aware of the Support Equipment Acquisition Management System (SEAMS)?

13. How often (if ever) must you report on the status of individual pieces of support equipment acquisition? To whom?

14. How often (if ever) must you report on the overall status of support equipment acquisition? To whom?

15. How do you track status?
    A. Of individual SE acquisition
    B. Of overall SE acquisition

16. Do you meet the "standard" time frames?

17. How do you use the Logistics Support Analysis Report for Engineering (LSAR E)?
    a. Pre-SERD meetings
    b. Phone/FAX contacts
    c. Other

18. When the SERD package is received,
    a. Who reviews it?
    b. What resources are available to assist?
    c. What do you look for?

19. Configuration Control Board (CCB)
    a. What organizations and disciplines are represented?
    b. What is the breadth and depth of the CCB review of the SERD?

20. SERD Statistics:
    a. What percent of SERDs are approved by the CCB?
    b. What percent of approved SERDs require an Engineering Change Proposal?
    c. What percent of approved SERDs go direct to a Statement of Work (SOW)?
    d. Who decides if an ECP is required?

21. Who participates in writing the ACSN? (what organizations/disciplines)

22. Generally, how long does it take to get an ACSN (to the contractor and ECP back) after SERD approval by the CCB?

23. Who reviews the ECPs? (organizations/disciplines) -- Are the authors part of the review team?

24. What percent of ECPs are approved by the CCB?

25. Is there a system in place to ensure ECP of the major end item is considered in SE?

26. How are approved ECPs on the end item evaluated to determine their impact on SE?

27. How do you learn of approved engineering change proposals (ECP) on the end item (that may affect SE)? (For contracting personnel: Are you in the loop for approved ECPs on the end item?)

28. Who helps prepare the SOW (organizations/disciplines)?

29. What kinds of problems have you encountered during the Support Equipment Conntracting Process?

30. What can you tell us about IWSM?

Appendix G: Synopsis of Interview Results

Introduction

The pre-set interview contained multiple questions concerning each SE acquisition process element, and interviewees' responses often overlapped. For this reason, respondents' answers are summarized by the step of the process and the discipline involved, except for responses to questions relating to the Configuration Control Board (CCB). All disciplines described the CCB same within each program. Therefore, the responses to questions relating to the CCB are summarized by program, rather than by discipline as was done with responses in other areas of the SE acquisition process.

Background of Respondents

Configuration. Six configuration managers were interviewed in three SPOs. (The SOF SPO does not have configuration managers -- this work is done by the Gunship and Combat Talon.) The range of experience within their programs ranged from 6 months to 18 years. The overall range of configuration experience was 5 years to 18 years. Three of the configuration managers were functional supervisors but only one lead an IPT.

Contracting. The researchers interviewed five contracting personnel in the four SPOs. Their experience in their respective programs ranged from 2 months to 4 years.

Their experience in the field of contracting ranged from 5 years to 16 years. Two brought related experience from outside the government. Two served as functional supervisors as well as IPT leaders, but all 5 also served as members of other teams.

Engineering. The researchers were able to interview two engineers in different programs. Each had over twenty-three years engineering experience. Both engineers interviewed were IPT team leaders.

Logistics. Eleven logisticians were interviewed from the four SPOs. Their experience in their respective programs ranged from six months to more than eight years. Their experience in the field of acquisition logistics ranged from six years to thirty-four years. Six of the eleven serve as IPT team leaders, four are functional supervisors, and three (in two different SPOs) were located at ALCs.

Office Structure

Configuration. The three SPOs seat most of their configuration personnel functionally. The supervisors reported that a shortage of manpower kept them from locating personnel in every IPT. Personnel support multiple IPTs; in one case this was six IPTs, but the usual figure was two or three. Even the co-located person was supporting multiple (four) IPTs. One SPO reported fierce competition between the formal IPTs and informal IPTs (Tiger Teams); this created resource problems that had to be settled by the

Management IPT. This same SPO reported trouble getting any additional assistance outside the IPT.

Contracting. All the contracting people interviewed sat in functional groupings where the personnel actions and taskings were handled by the functional chain of command. In one SPO an effort was being made to co-locate the personnel but there was no schedule for the functional chain to release its authority; this effort was being hampered by the lack of manpower to satisfy the requirement and a shortage of suitable office space.

All the contracting personnel supported multiple IPTs; so many IPTs that they were unable to attend most IPT meetings. In one case a buyer was asked to support 14 IPTs. Additional support from other disciplines was not a problem.

Engineering. The engineers interviewed sat in functional groupings because the engineers they lead were required to support multiple IPTs. In both cases the functional supervisor retained responsibility for personnel actions although tasking was done through the IPT chain.

Both engineers assured the researchers that they were fully supported by the SPO and had no trouble getting assistance either from other IPT members or functional specialists outside the IPT. Both considered the user and the ALC to be active, valued members of the IPT.

Logistics. Most of the logistician still sat functionally and supported multiple IPTs whether they were assigned to the ASC SPOs or the ALC. Only one ASC SPO had dispersed its people out to IPTs and its ALC counterpart had not. Another ASC SPO had distributed about two-thirds of the logisticians to "overall" IPTs. In almost all cases, the number of IPTs a logistician supported was deceptive because the official assignment to an IPT often hid the number of sub-IPTs that required support -- one logistician was on 11 such teams.

One ALC SPO had tried an IPT grouping but had returned to the functional grouping when they found that they could not distribute and protect access to a classified database. Others reported the functional chains were left intact because there was insufficient personnel, a need for greater functional interaction, and a shortage of appropriate office space. Tasking came through both the functional and the IPT chains, but personnel actions were generally the responsibility of the functional supervisor.

The ALCs considered themselves to be extensions of the SPO and the logisticians often referred to SPO East (ASC) and West (ALC) or SPO North (ASC) and South (ALC). Only one SPO reported problems with support from other disciplines; here, contracting frequently was delayed by high volume and lack of personnel.

Functional and Program Guidance and Tools

Configuration. There was a wide divergence in the guidance followed in this area. No two people quoted the same Military Standard and some noted, correctly, that the Air Force regulations (AFR) followed by others in the field had been rescinded. Two

of the SPOs had local operating instructions (OI). One of these was under revision, but the other was held to pre-IWSM standards by contract requirements. Most said that the most important guidance came from experience rather than anything they could find in writing.

Contracting. Every SPO used FAR-on-Line and some form of EXCEL spreadsheet that had been customized to the need of the SPO in the area of costing. In addition there were various SPO-unique computer systems for scheduling and tracking acquisition actions.

All the contracting personnel were guided by the FAR, FAR supplements, regulations, and policy letters. Beyond that they reported being guided by experience and the Logistics office.

Engineering. The engineers reportedly were guided by the SPO's OIs and experience in one case and by AFR 800-14, AFR 800-23, and DoD Standard 21-67 in the other. Neither one had any interaction with AFOSEM.

The engineers both used software developed and maintained exclusively for their SPO by a contractor. One engineer used SEAMS, but the other was not even aware that MIL-HDBK-300 had been automated.

Logistics. As with all the other disciplines, experience was more relied upon than any written guidance. Guidance cited varied markedly from individual to individual. The

ASC personnel were aware of AFOSEM and in two cases they reported extensive recent interaction with them; the ALCs knew that AFOSEM existed but had not had any recent contact with the office.

All the ASC personnel were assets of the AL functional office, but none of them used any of the AL software or logistics tools with the exception of SEAMS. The researchers were told by a contracting person that she had repeatedly asked her IPT's logisticians where and how she could acquire more knowledge of the SE acquisition process. They had indicated that *they* were her only available source because there was nothing beyond the regulations.

Reporting Systems

Configuration. This discipline consolidated *information*, but was not responsible for it. Across the SPOs, the configuration people called these questions non-applicable.

This field had little problem meeting the standard time frames. One SPO complained that their contracting people had caused them to miss many time frames.

Contracting. One person tracked acquisition actions manually. All the SPOs had some form of contractor-developed and -maintained tracking system. All the contracting personnel reported through their functional chain of command with input to the IPTs as requested.

All of these SPO functionals reported being unable to meet the "standard" time frames. Many reported problems with uneven levels of workload that made scheduling

their time difficult. They all reported that the IPTs were responsive and cooperative, but there were problems with the responsiveness of offices outside of the SPO, such as the Small Business Office and the Judge Advocate General (JAG).

Engineering. One Engineering IPT reports individual problem situations to the SERD review board and depends on the SPO-developed Support Equipment Acquisition Tracking System maintained by Logistics to track the program status. They had problems meeting standard time frames. The problem was the Consolidated Support Equipment Recommendation Data Evaluation Transmittal (AFLC Form 603). The ALC office required to provide this information was <u>not</u> part of the IPT at the ALC and the IPT "has had only limited success in pressuring them."

The other SPO allows the support contractor to maintain status of individual and overall SE acquisition. This status system measures program standing against a master schedule. This office reported being unable to meet the standard time frames because of a high volume of work and a shortage of people. Delays were also blamed on a change of acquisition strategies; some contracting had been delegated to the ALC, but the SPO reclaimed the workload when the ALC management proved to not be amenable to following the development acquisition procedures used by the SPO.

Logistics. In all of the SPOs the logisticians are responsible for controlling the processing of the SERDs and ECPs. They report status to the IPT lead and to the functional supervisor who is generally the same person. If the IPT lead is the functional

supervisor, he/she reports to the SPD. Exceptional situations are reported as required, but the IPT leaders have regular meetings about status with the SPD.

All of the logisticians used SPO-unique software to track and to manage SE actions. The SPO-unique software was not always developed by a contractor. Many of the logisticians reported adapting commercial software such as ENABLE, EXCEL, or LOTUS 123 to their needs; the reasons varied from contract requirements, to lack of knowledge about AL resources, to AL's lack of responsiveness to the users. One SPO relinquished responsibility for the tracking to a contractor who maintained a master schedule for all the disciplines in the SPO.

The 75 day time standard for SERD processing was considered to be completely unrealistic by three of the four SPOs while the fourth reported having little problem meeting or beating the deadline. The three with problems blamed agencies outside of the SPO for their difficulties. The first SPO had time frame problems only at the ALC which pointed out that the "clock" started when the SERD was received at the ASC-side of the SPO; the ALC sometimes received their copies from the contractor up to three weeks later. Another group of logisticians repeated the complaint of the engineer about the inability to get the AFLC Form 603 processed in a timely manner. The third SPO complained that getting comments back from users was a real problem, data calls were ignored, and there was too much "administrative bureaucracy."

The remaining SPO needed only 30 days to turn around SERDs. Their speed resulted from having the LSA on-line and from including every signatory on the team. They also standardized responses by means of a preliminary review document which was

attached to the review copies of the SERD. However, it must be noted that this SPO had processed less than two hundred SERDs at the time of this study.

SERD*

Configuration. The configuration managers all had no involvement with the LSAR-E or any pre-SERD activities.

Contracting. None of the offices had any involvement with the pre-SERD process.

Engineering. Both SPOs use the LSAR-E. However, they had very different opinions of the value of the document. One office reported that "over 70%" of the LSA applied to engineering. The other complained that the LSA was difficult to read and that it was hard to extract engineering information because most of the information was geared to the needs of Logistics.

Both hold LSA reviews prior to the submittal of SERDs. The more mature program looked to validate the need for a SERD. The other program was concerned that the predictions met the specification requirements and that the data rolled up correctly.

Logistics. One of the SPOs with a capability contract did not generally use the LSAR-E at the ASC-side of the SPO; instead they relied upon a maintenance plan. The ALC-side of the SPO did review the LSAR-E to look for problems and to expedite

preparation of the AFLC Form 603. The other capability contract SPO worked directly from the on-line LSAR-E. In their pre-SERD meetings, the goal was to minimize both common and peculiar SE rather than to merely look for the best solution.

One of the remaining SPOs found that the LSAR-E was too difficult for the logisticians to read and modified it to include more information in a more useful format. This modification facilitated the pre-SERD reviews. The last SPO used the LSAR-E with no difficulty. The integrator gathered usage rates and other relevant data before developing the logistics requirement.

SERD

Configuration. In all the SPOs the logistics function was responsible for tracking and managing the SERDs. The configuration managers in only two of the SPOs routinely scrutinized the SERDs. They ensured that the problem details in Part 1 were sufficient to justify the solution in Part 2 and determined whether the solution was complex enough to justify managing the item as a separate configuration item. In one SPO, the configuration office was concerned about the validity of the schedule and the need for kit proofing.

Contracting. In one SPO the contracting personnel review the SERDs for consistency with contract provisions. The other three reported no involvement at this point.

Engineering. SERD management was a logistic function in both SPOs. All disciplines (including those located at the ALC) were required to review every SERD. The engineers looked for the validity of the need, questioned the "sensibility" of the solution, and examined the benefit-to-cost ratio.

Logistics. The nature of their contracts prevented two of the SPOs from managing SERDs in the traditional fashion. They were both operating with "capability" contracts under which the contractor developed and demonstrated the weapon system support *in toto* rather than piecemeal. SERDs for informational purposes and for government furnished equipment (GFE) were being submitted and handled within the SPO in much the same fashion as traditional SERDs using concurrent reviews by all applicable agencies. Of these two, the first had problems at the ALC because the SERD process was not an operation internal to the IPT and received low priority from other organizations. The other SPO included every signatory on the team and standardized responses after developing a preliminary review document which was attached to the review copies of the SERD.

The other two SPOs reported no difference from the way they had always done SERDs. Processing had been unaffected by IWSM.

ECP

Configuration. Writing an ACSN fell to a logistician or project manager in all the SPOs. Configuration provided assistance in most cases.

About a year before this study, one SPO instituted a new system, the Draft ACSN Review, which resulted in a 95% approval rate on the first submission for all ECPs. The ACSN was sent to the contractor and his functionals had 10 working days to study the proposal. A teleconference followed within 5 days of this deadline and then the SPO had 5 more working days in which to update the ACSN. This resulted in the contractor and the SPO being in agreement as to what the ACSN contained and what information was required in the ECP.

Another SPO found that having a common computer file greatly improved the preparation of an ACSN. The ACSNs were joint efforts by the government and the contractor. Working groups included configuration management, computer resources, system engineers, related IPTs, and the contractor. The weakest area was cost estimating or the Rough Order of Magnitude (ROM), for which the contractor was solely responsible. The SPO had informal reviews prior to ECP submittal. Extensive use of video teleconferencing reduced incidences of misinterpretation and cut down on the error rate. Since the entire SPO wrote the ACSN with the contractor, the ECP was studied and reboarded only when the cost proposal was greater than the ROM.

Here, no-cost ACSNs generated by the SPO were treated as contractually binding by both contractor and SPO after boarding. This eliminated the time and money required to prepare and review an ECP/CCP. The ACSNs with costs involved took about 75 days to return in the form of ECP/CCPs. Lacking impact on a subcontractor, the time was reduced by 20 days.

Contracting. The SPOs all reported reviewing the ACSN and the ECP. Two SPOs expect the contracting personnel to be actively involved in the preparation of the ACSN from the time the requirement is determined.

Engineering. One SPO reports not having to write any Advance Change Study Notice (ACSN) because they usually have sufficient information within the SERD itself to authorize the preparation of an ECP in accordance with the provisions of the contract. The engineer reported that it takes up to nine months to get a routine ECP from the contractor after the CCB authorization. Once received, the ECP is reviewed by the entire SPO, the ALC, and all other affected parties. Internally, this ensures that SE requirements and the funding for those requirements are considered. Problems arise when the ECP is generated for a end item managed by another SPO; in these cases, the other SPO does not always notify this SPO of the change in a timely manner.

The second SPO has the IPT prepare an ACSN under the leadership of the IPT leader. This engineer felt that he could not validly comment on the average length of time required to obtain an ECP and was unable to provide the researchers with any historical data. Once received, the ECP is reviewed by the entire SPO, the ALC, and all other affected parties. The engineer stated that the system required that every ECP address all SE impacts including the SE-for-SE.

Logistics. The SPOs with capability contracts did not have ECPs because they did not yet have an SE baseline to change. The other two SPOs had systems in place to

process the ECPs and to ensure that the SE and the end item ECPs were worked in tandem. These systems worked well but the process was lengthy.

One of these SPOs had replaced the formal ACSN with a letter-format Request for Proposal (RFP) or Request for Quote (RFQ) initiated by the IPT and managed by the project lead. This reduced the overall acquisition time by eliminating ECP processing, but still took 90 to 120 days for the SPO to initiate and the contractor to respond.

Statement of Work (SOW)

Configuration. Only one SPO reported participating in the creation of an SOW. All the disciplines, including contracting, were involved from the beginning. They reviewed the SOW with a functional review and had ample opportunity for input. The personnel from the remaining SPOs were unaware of any SOWs having been prepared within recent memory and felt unequipped to comment on how the process would be handled.

Contracting. Most of the contracting functionals were active participants in the creation of the SOW as well as members of the review teams.

Engineering. The engineers reported that the entire IPT, including the user and the ALC, participated in the preparation and review of any SOW. However, one SPO reported that there were problems getting feedback on the status of contracting actions

once the SOW was written. This was a problem internal to the SPO and did not apply to the sustaining engineering contracting handled by the ALC.

Logistics. From the viewpoint of the logisticians, all the disciplines participate in the creation of the SOW under the direction of the IPT lead or the SE manager. The lead consolidates the input of all the functionals and turns the result over to Contracting.

Comments about IWSM

Configuration. Generally, the configuration managers reported that IWSM had not significantly changed the way they did their day-to-day jobs. While they expressed the belief that "IWSM is nothing more than running your program in a sensible fashion," they were apprehensive that the elimination of the formal PMRT had created ambiguity as to when responsibility should be transferred from the development side of the SPO (at ASC) to the sustaining side of the SPO (at the ALC). One configuration manager commented that he was concerned that configuration records would be lost when responsibility for an item was transferred, because there was no configuration management organization at the ALC. Configuration managers in another program remarked that the "PMRT mindset" still existed. Calling the ALC part of the SPO didn't make it so; the wide geographic separation and the differences in the way ASC and the ALC worked prevented their truly being "one team."

One configuration manager commented that co-locating the functions in IPTs made it difficult for personnel to keep current with the state of the practice within the

function. Another one remarked that they had had over forty process improvement changes since implementation of IWSM. These changes had been made informally, at relatively low levels, because of the bureaucratic red tape involved in getting changes approved formally.

Contracting. One of the functional supervisors predicted that projected personnel cuts would eliminate any real IPTs because there will be a serious manpower shortage in the contracting area. Every one of the subjects commented on the improved communications between the functional areas and the ALCs.

Engineering. One engineer complained that the process is not really seamless. SE still has a workload transfer from ASC to the ALC; only the term "PMRT" has been changed to "consignment" or "workload transfer." This same engineer commented that while the IPTs did respond more quickly, the benefits were offset by the loss of commonality and the requirement for additional personnel. He credited the IPT with providing better communication, but stated that it was his belief that better communication came more from necessity than from mandate.

The other engineer also commented that the "PMRT" had not disappeared and could not disappear as long as there are separate development and support organizations at separate locations. He was concerned that downsizing was antithetical to IWSM; that there are limits to "doing more with less." Likewise, he commented that the Air Force has always tried to get the "right people in the right place at the right time."

Logistics. All the SPOs remarked about the better communications that the team effort engendered. Successful SPOs had always managed their programs as a team effort. While IWSM had resulted in very little change in the day tc day operations at either ASC or ALC, it had sharpened the focus of working as a group. One SPO was pleased to report that the disciplines in place between the ALC and ASC had become complementary rather than duplicative.

One ALC complained that the new incremental transfer had increased the paperwork hurdles. In the same vein, another logistician was critical of the incremental transfer because there was still a mindset that a difference existed between acquisition and sustainment; he found the lack of an official transfer awkward.

A functional supervisor found that evaluating his personnel was extremely difficult since he was not in day-to-day contact with them and had to rely on feedback from the IPT leader.

Much was made of the fact that in the case of SE the "Single Face to the User" was a farce. Several people voiced comments similar to the speaker who said, "There is too great a variety of SE managed at too many different places . As the Air Force goes to more and more common equipment, this will get worse."

Configuration Control Board (CCB)

C-17. In this SPO, the CCB delegated SE issues to the Support Equipment Management Control Board (SEMCB). The entire IPT scrubbed the SERDs before

presentation to the board which acted as a rubber stamp -- approving 90% outright and returning 10% to the contractor for more clarification. The ALC did not take part in the deliberations of the board; its support was limited to processing the AFLC Form 603.

F-16. There was just one CCB seated for the entire weapon system; although SE issues were delegated to a SERD Review Board. The CCB acted as a rubber stamp since the SPO requires all controversies to be settled prior to boarding a proposal. A checklist ensured that all issues were addressed.

F-22. The SPO had a CCB but only submitted unplanned and unbudgeted SE requirements; the SE IPT controlled their own budget and approved or disapproved SERDs within that budget. The SPO responded to the contractor's submission with a consolidated response form. Of 180 submissions, 45 were rejected when the IPT proposed alternate solutions.

SOF. All organizations and disciplines are represented by their 2-letter heads on the CCB. The board permitted actions under $5 million to be reviewed at the lower level SERD Review Board. Most SE acquisition costs less than $5 million. The process controller acted as program manager and was responsible for resolving all the issues within the IPT (this included the user and the ALC). The SERD Review Board did not usually hold formal meetings; the SERDs were hand-carried around the IPT for coordination.

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The Air Force Institute of Technology gave her the opportunity to expand her horizons and provided numerous challenges in her studies toward a degree in acquisition logistics. Her modest successes are in large part due to the desire to excel instilled by her parents, the late George and Cecilia Kwiecinski, to the love provided by her godmother, Helen Cottle, and to the unwavering support of a phalanx of friends who were never more than a phone call away.

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13. ABSTRACT *(Maximum 200 words)*

This study investigated the impact of the implementation of Integrated Weapon System Management (IWSM) on the support equipment acquisition process. The literature search revealed that IWSM is the latest of many Air Force attempts to ensure all aspects of a weapon system's life cycle are considered when acquisition decisions are made. Areas of interest included organizational structure; inter-functional relationships; procedural changes; and procedural guidance and automated tools used. Two years after IWSM implementation, interviews were conducted with twenty-four people in various functional disciplines in four System Program Offices and included both Aerospace Systems Center (ASC) and Air Logistics Center (ALC) personnel. Although there were no significant changes in office structure, the use of the term "Integrated Product Team" to describe working groups had improved the inter-functional relationships and communication among offices. This shortened the time required to perform some steps of the process. The research found little or no common procedural guidance used among the SPOs, other than the Federal Acquisition Regulation (FAR) for contracting. Also, SPO-unique software was in common use, instead of automated tools from the Acquisition Logistics Toolbox and Index.

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