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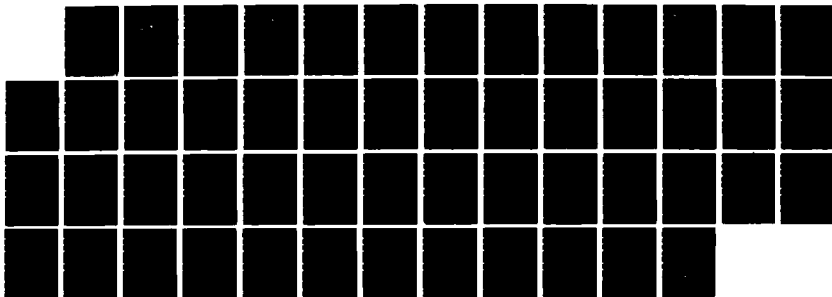
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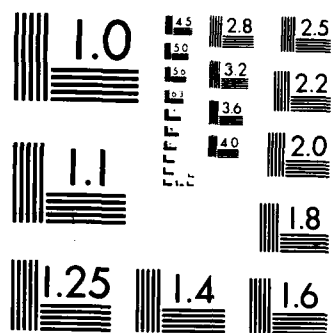
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AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

AIR FORCE MODIFICATION PROGRAMS--
INTERACTION OF AIR FORCE LOGISTICS
COMMAND AND AIR FORCE SYSTEMS COMMAND

MAJOR ROSANNE BAILEY

88-0155

"insights into tomorrow"

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REPORT NUMBER 88-0155

TITLE AIR FORCE MODIFICATION PROGRAMS--INTERACTION OF
AIR FORCE LOGISTICS COMMAND AND AIR FORCE
SYSTEMS COMMAND

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requirements for graduation.

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PREFACE

The purpose of this study was to examine the interaction between Air Force Systems Command (AFSC) and Air Force Logistics Command (AFLC) during the development, acquisition, and implementation of Class IV and Class V modifications. The topic was chosen for two reasons. The first is that modifications are becoming an increasingly important way to sustain and improve an effective United States defense posture. The second is that an interaction problem was perceived by the author during her tenure as program manager for a major Class IV modification.

This preface provides a guide to the study for any who prefer to get straight to their area of interest. Those who are interested in a summary and recommendations should read the executive summary and then turn to Chapter Five. If the reader is interested in the review of regulatory guidance, it can be found in Chapter Two. Chapter Three provides a review of the previous studies, lessons learned, and interviews with experienced managers. A shorter review of Chapters Two and Three is found in the analysis of the issues in Chapter Four.



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ABOUT THE AUTHOR

Major Rosanne Bailey received her BS in Industrial Management with Honors in Economics from Purdue University in 1973. After working in a bank for four years, she was commissioned through OTS in 1977. She earned her MS in Engineering Management from the Air Force Institute of Technology in 1984, where she coauthored a thesis titled "United States Air Force Aircraft Modification Process: A System Dynamics Analysis." She has served as a supply officer; as a program analyst and project manager in the JTIDS joint program office; as a systems officer at HQ Air Force Systems Command (AFSC); as an executive officer for the DCS Manpower and Personnel at HQ AFSC; and as a program manager for the F-111 Digital Flight Control System. In 1987 she became Level III certified in acquisition management. She graduated from SOS in 1980 and ACSC in 1988.

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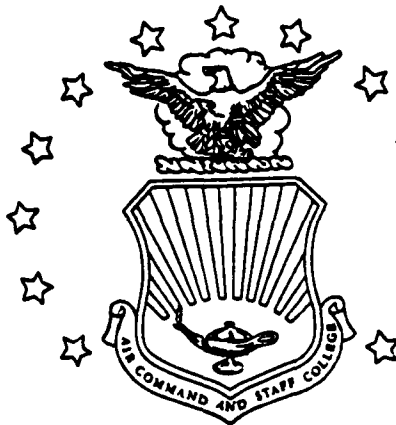
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EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DoD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

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REPORT NUMBER 88-0155

AUTHOR(S) MAJOR ROSANNE BAILEY

TITLE AIR FORCE MODIFICATION PROGRAMS--GUIDING INTERACTION OF
AIR FORCE LOGISTICS COMMAND AND AIR FORCE SYSTEMS
COMMAND

I. Purpose: To establish that the interaction between Air Force Logistics Command and Air Force Systems Command is important to the success of modification programs, that this interaction is inadequately guided, and to provide recommendations for improving the process to better assure success.

II. Problem: The modification of deployed weapon systems offers to the Air Force something of a predicament. As a T.I.G. Brief in 1981 stated,

"It offers the Air Force a means to improve ... safety, maintainability, and mission accomplishment, and can add significant new capabilities. At the same time, poor planning can aggravate minor deficiencies and can even lead to the introduction of new deficiencies. For the modification process to work efficiently, communication must occur between the designer, user, and supporter of the equipment. (6:8)

CONTINUED

The modification of existing systems is becoming increasingly important to the Air Force as the available funding for new weapons systems shrinks. Similarly, as modification becomes more important, the modification process comes under more scrutiny. When the author managed a modification program for AFSC, it became apparent that no real guidance existed to indicate how AFSC and AFLC should interact on modification programs where AFLC had program management responsibility for the weapon system and AFSC was developing the modification. The problem examined in this study, therefore, was whether guidance could be provided to facilitate the interaction of AFSC system program office personnel with AFLC system program managers during the AFSC development and production of Class IV and Class V modifications to weapons systems under AFLC control.

III. Data: The study was conducted, with data collection occurring in three phases. It began with an extensive review of all regulatory guidance that mentioned modifications. This included Air Force, AFLC, and AFSC regulations, manuals, pamphlets, and handbooks. A review of the applicable documents is provided. At the same time a search was made of the literature to locate articles, studies, analyses, theses, anything written about modification management. The resulting set of documents were carefully reviewed for any direction or discussion on the interaction between AFSC and AFLC during modification management. Following these two phases, modification managers from AFSC, AFLC, and Headquarters Air Force were interviewed informally to determine whether the problems identified in the studies and the inconsistencies and inadequacies noted in the regulations were still considered problems by today's managers. An extensive review of the studies and the interviews is provided in the study. Analysis of the interview results, the studies, and the regulations led to the formulation of four key issues with interaction in modification management. Further review of the interviews and the studies, plus the author's experience with the process, led to some alternatives for resolving the issues. The issues are 1) definition of responsibilities and authority between the commands, 2) adequacy of the communication between the commands, 3) adequacy of guidance documents, including regulatory documents and Program Management Directives (PMD), and 4) the personality dependence of success in modification management.

IV. Conclusions: The nature of the relationship between the commands is unique to each modification program. Therefore no "standard" relationship can be defined. However, some standard techniques for defining each relationship can be

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established to achieve success. The current regulations and PMDs do not adequately address the interaction between the commands during modification management. Current Air Force thinking confirms the problem exists and should be fixed. Relatively minor changes to the modification environment can reduce the problem and improve the potential for success.

V. Recommendations: Existing regulations and pamphlets should be revised and expanded to incorporate more information on modification management, more cross-references to related regulations, and a requirement for the two commands' participating organizations to enact an agreement which defines the responsibilities and authorities relative to the modification program. Long range or master plans for the weapon system and steering committees should be provided for in the regulations, where complexity of modification planning so dictates. Overall PMDs should be issued for weapon systems to provide coherence to the various modifications programs affecting the system. Managers involved in modification programs at AFSC and AFLC should be trained using the revised pamphlets and regulations. Communications between the commands should receive continued emphasis.

Chapter One

PROBLEM DEFINITION

I. INTRODUCTION

"The Department of Defense (DOD) sustains its weapon systems for an effective United States defense posture in two ways. The first, and best known, is through the design, development, acquisition, and deployment of new weapon systems. The second way is the modification of existing systems to add new capabilities, to correct deficiencies, and/or to extend their operational life. In recent years the modification of existing systems to achieve desired capability has been increasingly advocated as the quickest and most cost-effective way to achieve a modern force under severe budget constraints." (3:2) This statement is as true today as it was in 1984. As the cost of new systems continues to increase and the federal budget, especially the defense budget, "receives closer scrutiny and harsher criticism," this second method becomes more and more attractive. (3:2)

The funding for modifications has grown significantly over the last 10 years, and is projected to continue growing in the Five Year Defense Plan (FYDP). Although reductions in modification funding have appeared in the most recent fiscal year (FY), as a result of across the board reductions imposed by Congress, the overall trend and the need for the funding continues upward. Table 1 below illustrates this trend.

<u>FY</u>	<u>*Funding</u>	<u>FY</u>	<u>*Funding</u>
82	\$2,251.3	(proj)89	\$2,093.2
83	2,564.9	(FYDP)90	3,264.5
84	2,841.2	(")91	3,475.8
85	3,225.5	(")92	3,326.2
86	2,684.2	(")93	3,701.3
(est.)87	3,123.8	(")94	4,111.7
(proj)88	2,034.7		

TABLE 1
Aircraft Modification Funding (13:31,101-107; 14:C-24, F-1,
H-7 - H-13; 15:C-43 - C-49, F-13, F-32; 11:--)
*(procurement \$ millions)

As a result of the increasing funding for modifications, there has also been increased interest in the process of modification management. Numerous studies have examined the process, particularly as it pertains to Class IV and Class V modifications. These two classes of modifications are fully defined later, but for now they can be considered the types which return a system to full mission capability or add new capability to the system. (17:--) These studies have tried to analyze various problems in the process, and in the case mentioned below, describe the modification process through development of a model.

In 1983-84, as a graduate student at the Air Force Institute of Technology (AFIT), the author and another student researched the Air Force aircraft modification process and created a conceptual model of the process and its policy structure. The information was drawn from regulations, earlier studies, and informal interviews with policymakers and modification experts at command and higher levels. Subsequently, she became an Air Force System Command (AFSC) program manager for the F-111 Digital Flight Control System (DFCS) modification program. During this program, she became heavily involved with the Air Force Logistics Command (AFLC), and the question developed of how AFSC and AFLC should relate. It appeared that no real guidance existed to show the two program managers how to interact, despite her observation that an increasing number of Class IV modifications were being assigned to AFSC for development. In AFSC the program managers are guided by AFR 800-series regulations, while in AFLC they are guided by the AFR 57-series regulations. This experience suggested that the topic of interaction between AFSC and AFLC on modification programs deserved further study, particularly in the area of regulatory guidance.

II. PROBLEM STATEMENT

The problem described above can be stated succinctly as follows: Can guidance be provided to facilitate the interaction of AFSC System Program Office (SPO) personnel with AFLC Weapon System Program Managers (SPM) during the AFSC development and production of Class IV and Class V modifications to weapon systems under AFLC control?

III. OBJECTIVES

In order to determine whether guidance can be provided, it is necessary first to determine the nature of the relationship between the commands during modification programs. Secondly, the treatment of modifications under current regulations must be examined. It is possible that some regulation outside the

standard series, or some passages in the 800 and 57 series regulations do adequately treat this interaction. Third, current Air Force thinking on the interaction problems must be investigated. Others may not consider the command interaction a problem. If they do, they may have some suggestions or experiences in correcting the problem. The final objective is to recommend changes to the system.

IV. BACKGROUND

This section provides the background of the study. It reviews the definitions and basis for modifications, provides a description of the study effort, and discusses the limits of the study. A guide to the remainder of the study is also provided.

Definition of Terms. Provided below are the operational definitions of terms used in this study.

Aircraft Modification as defined by DODD 5000.8 and excerpted by the Compendium of Authenticated Systems and Logistics Terms, Definitions, and Acronyms is "a change in an airframe, component, or equipment that affects performance, ability to perform intended mission, flight safety, production, or maintenance." (12:459) Missile modification, while not specifically defined in the compendium or the regulations, may be considered to adhere to essentially the same definition.

Classes of Modification. AFR 57-4 (17:3-4) provides a descriptive breakout of modifications into five classes.

Class I - A temporary removal or installation of, or change to, equipment for a special mission or purpose.

Class II - A temporary modification to support research, development, or operational test and evaluation efforts.

Class III - Modifications required to insure production continuity.

Class IV - Modifications to insure safety of flight, to correct a deficiency which impedes mission accomplishment, or to improve logistic support.

Class V - Installation or removal of equipment changing the mission capability of the present system configuration.

Basis of Modifications. Two factors determine the class of the modification: what command owns the system, and whether the modification will change capability or merely return the system to full capability. If AFSC still owns the system (i.e., Program Management Responsibility Transfer (PMRT) has not occurred), then a modification to correct a deficiency (return the system to full capability) is classified a Class

III modification. If AFLC owns the system (PMRT has occurred), then a correction of deficiencies modification will be a Class IV modification. Regardless of command ownership, if a new capability is to be added, or a now useless capability removed, the modification is a Class V modification.

Class IV and Class V modifications originate for a variety of reasons. The most basic reasons are listed in the definitions above. However, some examples may help bring life to those reasons. When the F-111 experienced uncommanded maneuvers, such as violent pitchdowns on takeoff, which were traced to the flight control computers, a Class IVA modification to correct the threat to safety was started. When the F-111 Bomb-Navigation system experienced reliability less than the length of a typical mission, the modification to eliminate the mission deficiency was classified as a Class IVB modification. As often happens, correcting the mission deficiency above also led to significantly improved logistics support, which by itself would be a Class IVC modification. Since the higher priority classification applied, it would always be used--the priority affects the funding of the modifications. Strategic Air Command changed the endurance requirement for launch-essential Intercontinental Ballistic Missile (ICBM) facilities at all wings. (29:24) The modification to incorporate this requirement--a new capability--was identified as a Class V modification.

V. DESCRIPTION AND LIMITS OF THE STUDY

To meet the objectives of this study, many printed sources and a number of experienced managers in the field were consulted. First, to determine the nature of the relationship between the commands, the author drew upon experience and researched previous studies and articles. Additionally, managers currently involved with Class IV and Class V modifications were informally interviewed. The plan was to define the relationship, establish that a problem does exist, characterize the problems, and find any successes and the secrets of those successes.

To determine how modifications are treated under current regulations, current Air Force (AF), AFLC, AFSC, and AFSC/AFLC regulations, pamphlets, manuals, and handbooks were reviewed. The specific goal was to determine whether AFLC/AFSC interaction is addressed by guidance, and if so, whether that guidance is adequate.

Current AF thinking on these problems was investigated to determine what, if anything is wrong, and to identify ways to

fix the problems. This was done by requesting a printout from the AFSC/AFLC Lessons Learned program and conducting informal interviews with managers from both commands and the Air Staff. This information was analyzed to determine the problems and their causes. Alternatives for solving the identified problems were developed based on the above sources.

Finally, the study provides recommendations for changes to the process of modification management to improve the interaction between AFSC and AFLC. These recommendations resulted from the analysis of the information provided by the above sources and of the alternatives.

The study was limited to examining only one aspect of modification management, and only as it related to Class IV and Class V modifications. The aspect of interaction between AFLC and AFSC was chosen because the author's experience in research and program management suggested the degree and quality of interaction could make the difference between a successful and an unsuccessful program. The choice was encouraged by the project's sponsors, who are in positions to oversee many modification programs and their problems. Col Frederick L. Ayer is the Assistant Deputy Chief of Staff for Product Assurance and Acquisition Logistics at Headquarters AFSC, and Col (Brig Gen sel) Lewis E. Curtis, III is the Assistant Deputy Chief of Staff for Material Management at Headquarters AFLC.

The study was limited to Class IV and Class V modifications because only with those two classes does the AFLC/AFSC interaction become critical. In both classes, the weapon system is under the control of AFLC, and the modification may be developed by AFSC for eventual installation by AFLC. AFLC may develop the modification, but in that case no interaction occurs. AFLC provides system configuration information to AFSC to permit the contractor to design against a baseline, but during the course of the development process, AFLC continues to maintain and modify the weapon system with other changes. If AFSC/AFLC interaction is not maintained, the fully developed modification could arrive at the weapon system for installation only to find it no longer fit because some other modification changed the available space or connections. Redesign at increased cost and delayed installation schedules result.

VI. OVERVIEW OF THE STUDY

In this first chapter the importance of the modification process and the problems of interaction of AFSC and AFLC were

introduced. The problem was stated, the objectives were identified, and the plan for meeting the objectives, within the limits of the study, was presented. In Chapter II the treatment of AFSC/AFLC interaction in the various regulations, pamphlets, manuals, and handbooks will be presented. In Chapter III a review of previous studies and analyses will be provided, along with presentation of the results of the informal interviews. The nature of the relationship between the commands will develop in the course of this discussion. Chapter IV presents key issues and problems in the system, and Chapter V summarizes the study, presents conclusions, and recommends changes to the system.

Chapter Two

CURRENT GUIDANCE ON AFSC/AFLC INTERACTION

I. INTRODUCTION

Guidance documents specific to the modification process are largely grouped in two series, the 57-series and the 800-series. The 57-series is considered by AFLC as their "bible," and AFSC regards as "bible" the 800-series. Each tends to ignore the other series. An additional regulation in each of the 27-series and the 66-series applies to modifications. Although these regulations provide detailed guidance on modifications, none specifically guide how AFSC and AFLC should interact in modification management. In this section the pertinent documents will be described in numerical order, with detail provided on any sections that specifically recognize the AFSC/AFLC interaction required for modification management.

II. THE 27-SERIES GUIDANCE

The 27-series has AFR 27-8, titled Systems and Equipment Modification and Maintenance Program, which provides policy and assignment of responsibilities for the programming of modifications in the annual Program Objective Memorandum (POM) process. Responsibilities for submission of requirements by each of the two commands are identified--but no mention of command interaction. (16:--)

III. THE 57-SERIES GUIDANCE

The 57-series has two regulations that specifically pertain to modifications. The first, AFR 57-4, titled Modification Program Approval and Management, provides the "procedures for planning, documenting, obtaining approval, and managing the modification." (17:1) This regulation spells out in detail these procedures. However, its only mention of interaction is found in the Modification Policies section under Implementation Responsibilities.

Following PMRT to AFLC, there may be some mods [sic] which will require major development. In these cases, AFSC will be tasked to accomplish development by the PMD [Program Management Directive]; however, AFLC will retain the integrating responsibility . . . In those cases, the two commands will coordinate mutually agreeable arrangements for the management of the program consistent with the PMD. (17:5)

AFR 57-4 also spells out the responsibilities of the two commands--but nowhere else does it consider the interaction between the two nor does it reference AFR 800-2 guidance of program management. (17:--) This regulation is considered the bible of modification management by AFLC program managers. In contrast, when the author was interviewed by the AFSC inspector general team on her program, the team members involved had never heard of this regulation and were unconvinced that it had application to the Class IV modification program under discussion. The second 57-series regulation that addresses modifications is AFLCR/AFSCR 57-7, titled Operational Requirements Purchase Request and Military Interdepartmental Purchase Request (MIPR) Operations, which discusses funding documents for modifications in detail, but does not address any management issues. (18:--)

AFSC Pamphlet 57-2, titled Modification Management (26:--), describes the complexities of modification management for the AFSC program manager. This pamphlet generally provides a high quality guide for the modification manager, including some treatment of the requirement for interaction, or "interface," as the document terms it, with AFLC. It specifically identifies the major AFLC offices with whom the AFSC program manager should develop a formal interface. The pamphlet also warns the manager of the likely existence of modifications in development by other AFSC or AFLC organizations, some of whom might be planning to use the same space, cooling, electrical connections, weight or computer capacity that is planned for the AFSC manager's modification. (26:8) However, this pamphlet does not recommend or even suggest any mechanisms for preventing or resolving potential problems, other than suggesting the program manager consult the Lessons Learned program managed by the Air Force Acquisition Logistics Center at Wright-Patterson AFB.

Other 57-series regulations exist, but review of them showed that modification management is not addressed, nor is any mention made of the interaction between AFSC and AFLC.

IV. THE 66-SERIES GUIDANCE

One 66-series regulation addresses management responsibilities for modifications to Air Force ICBMs. This regulation is AFR 66-2, Single Manager for Modification, Major Maintenance, and Test Programs on Air Force ICBM Systems. Due to unique features of the ICBM force, any technical alterations to the ICBMs in their launch environment requires a very precise delineation of responsibilities. While the regulation does not address AFSC/AFLC interaction in so many words, it does define their relationship and tasks all the commands involved (users, supporters, etc.) to develop a management plan that further defines the activity planned and each command's responsibilities. (19:--)

V. THE 800-SERIES GUIDANCE

The AFSC program manager views the 800-series regulations as the "bible" of acquisition. Four 800-series regulations with their command supplements address (or should address) modifications in some way. As has been done so far, they will be reviewed in numerical order.

AFR 800-2, Acquisition Program Management, prescribes the system acquisition process, and implements the Department of Defense (DOD) Directive 5000.1 and DOD Instruction 5000.2. AFR 800-2's only mention of modifications is on the first page in the introduction, where it states that "All persons involved in acquisition programs, including major modifications, must comply with this regulation." (20:1) Later the regulation lists as a responsibility of the program manager compliance with the 800-series regulations, but never mentions the 57-series regulations that guide modifications as indicated above. An AFLC supplement to this regulation references AFR 57-4 as guidance for modifications, but that's unlikely to be seen by the AFSC manager. Nowhere does it address the question of interaction between the commands when AFLC owns the weapon system and AFSC is developing or acquiring a major modification. In fact, the only reference to involvement with AFLC discusses the development of the support concept and capability, and the plans for program management responsibility transfer (PMRT). (20:--)

AFR 800-4, Transfer of Program Management Responsibility, does not address modifications in the basic regulation. However, the AFLC-AFSC Supplement 1 does provide some guidance on the transfer of responsibility for modifications. It states,

The AFLC SPM and system or equipment IM [item manager] must be involved early with AFSC in the acquisition planning, design, and development of the systems or equipment for the modification program, and must maintain an active interface to carry out the retrofit of the weapon system. (21:5)

This seems to be a motherhood statement, well intended but not specific in guidance or set up of responsibilities. No other mention is made of modification management.

AFLCP/AFSCP 800-34, Acquisition Logistics Management (22:--), provides a comprehensive discussion of Class V modification management, but ignores Class IV modifications altogether. As a pamphlet, 800-34 cannot direct actions, but it does provide detailed information on procedures of the modification acquisition process, responsibilities of the various offices and managers, sequences of events as the modification progresses, and potential scenarios that could occur with varying conditions. It also specifically references AFR 57-4 for guidance on modification approval and management. AFLC/AFSC interaction is not separately addressed, but applicable discussion is interspersed throughout the chapter on Class V modifications. For example, it states that ". . . it is possible that the modification would be assigned directly to AFLC. AFLC may then receive engineering support from AFSC if special expertise is required." (22:35-2) Although Class IV modifications are not addressed at all, incorporation of them into this pamphlet would not be difficult. Much of the discussion is applicable to both classes of modifications. Thus, areas of cooperation are fairly well covered, although techniques for achieving successful interface are not discussed.

VI. SUMMARY

As the preceding discussion of regulations and pamphlets suggests, modification management is guided to some extent, but mostly in non-binding pamphlets. Significant holes exist in the binding guidance. The scanty mention of Class IV modifications in the 800-series regulations suggests no AFSC involvement in these modifications, yet the number of Class IV modifications assigned to AFSC for development appears to be increasing. The 57-series and 800-series regulations show little recognition of each other's existence, except in the supplements and pamphlets, and no indication that they should be used together. The importance of the interaction between

AFSC and AFLC is noted, but then ignored when procedures and techniques are set out. Examination of the guidance alone, even prior to considering current Air Force thinking on modification management, suggests some changes may be necessary. Suggestions for changes will be provided in Chapter IV.

A review of previous studies and results of the informal interviews, presented in the next chapter, will highlight the problems in the relationship between AFLC and AFSC and offer some thoughts for solutions.

Chapter Three

THINKING ABOUT THE PROBLEM

I. INTRODUCTION

As the modification process has increased in complexity, importance, and dollars spent in recent years, the amount of attention to the process itself has increased. Guidebooks have been written as research projects at the Defense Systems Management College (DSMC), theses at the Air Force Institute of Technology (AFIT) have focused on the process, research projects completed for ACSC evaluate it, and general officers, frustrated with the process, have directed high level studies. Currently modifications are again being examined as one solution to the budget crunch that inhibits new system development. Many people involved in the process have thought hard about the problems they have experienced and in some cases have proposed solutions that have worked for them. This chapter reviews the studies of the modification process that apply to the management of modifications, especially those that consider or identify AFSC/AFLC interaction as an issue or problem. Many of these studies focus on Class V modifications, but the problems facing Class IV modifications are similar. This chapter also provides the results of an inquiry to the AFALD Lessons Learned program and describes the current thinking on the problem by reporting on the informal interviews conducted for this study.

II. PREVIOUS STUDIES AND ANALYSES

The earliest study found that examined modification management responsibilities was a thesis prepared by Haslam and Berger at AFIT in 1973. They addressed management responsibilities for Class IV and Class V modifications and attributed problems in the process to a lack of understanding by process participants of their own and interfacing organizations' responsibilities. Haslam and Berger recommended better operating instructions, periodic briefings on responsibilities of own and interfacing organizations, inspections for compliance with guidance, the use of flow charts (which they developed) to explain the process, and

working committees that involve people from the SPO, the System Manager (SM, or today the SPM), the contractor, and the using command to improve the interface. (7:59-64) The flow charts and their suggestions remain usable today.

In 1977 Lt Col Reginald M. Cilvik wrote for DSMC a guide to Class V modification management. This study presents a full consolidation of the guidance provided to modification managers by both AFSC and AFLC. It also addresses inter-command coordination difficulties and lists recommendations for modification management and planning. Cilvik emphasizes that "communications and information flow must be smooth and continuous if the modification is to be effectively controlled." (5:30) He went on to present the result of interviews conducted with AFSC and AFLC managers. He reported an AFLC perception that AFSC managers did not understand the different financial arrangements for modifications, and frequently provided very optimistic--unrealistic even--schedules and cost estimates to AFLC. The AFSC perception was that the interface between AFLC and AFSC was not good enough, and that the PMD needed to task AFLC to get involved very early in the development process. Both commands representatives perceived that "personnel tended to be development or logistics oriented with little cross breeding, resulting in poor understanding of the other point of view." (5:33-37) This supports the premise of the Haslam and Berger study. Cilvik recommends early and continuing involvement of AFLC in the development phases of modifications, and emphasizes the importance of "careful attention to the significant coordination and information flow." (5:38) However, he did not recommend any specific methods for implementing these improvements.

In May 1978 Capt Kubecka examined the problems in the Class V modification process in his ACSC research report. He states that a lack of an integrated approach to the process exists, and that the problem begins with a split of responsibility for Class V modifications in the Air Staff. Management responsibility for a modification in development belonged to the Deputy Chief of Staff for Research Development and Acquisition (USAF/RD) (now Military Deputy to the Assistant Secretary of the Air Force for Acquisition (SAF/AQ)), but when it entered production, that responsibility transferred to the Deputy Chief of Staff for Logistics (USAF/LG, now USAF/LE). This split of responsibilities [still true today] continues down to the SPO and SPM level, where each has separate roles but "integration of effort is definitely needed." (9:31) He reported on an example of the Joint Tactical Information Distribution System (JTIDS), where the original plan called for 25 percent of the F-15 fleet to be in modification at a time. This was unacceptable to the user and AFLC. The document would never have been printed had the SPO

coordinated with the SPM--who at the time was not very involved with the validation phase program. (9:33) Exacerbating the problems of lack of integration are PMDs that do not require AFLC involvement and a lack of temporary duty (TDY) funds for AFLC personnel to attend AFSC planning meetings. (9:30-36) Kubecka recommends that both parties be required to coordinate on cost estimates, that AFLC involvement be required by the earliest modification PMDs, and that the definition of the AFLC involvement be provided by a joint AFLC/AFSC regulation.

Another 1978 ACSC paper, by Maj Bagley, also identified the interaction between AFLC and AFSC as a problem prior to the F4-E Advanced Avionics Integration Program (AAIP). (1:36) An attempt to create a Memorandum of Understanding between AFLC and AFSC failed because there was an impression that the regulations already defined the respective responsibilities adequately, and nothing unusual was required. Yet, program realities were different from the regulations, and problems were encountered. (1:36-37) They were able to alleviate the problem by "the assignment of a full-time, fully qualified AFLC expert to the . . . SPO within AFSC." (1:37) The biggest part of the problem was "who's in charge." There were a number of changes being developed in various places, but no one had the overall authority to drive changes, force accommodation, and fund extra costs resulting from these activities. While this specific problem did not involve AFLC, it is very similar to problems AFLC experiences with multiple SPOs at AFSC all trying to use space, weight, cooling, and cockpit space for their own modifications. When the AAIP was created, it provided the necessary centralized planning, which resulted in fewer test resources required, less aircraft downtime, and resolution of deficiencies. Bagley strongly recommended that "a single point of authority and responsibility be identified," and that "the authority and responsibility between AFSC and AFLC must be clearly defined." (1:54)

Klein and Smigel examined the process in 1979, and found that "faulty communication and coordination exchanges between the commands cause problems that can adversely affect the successful fielding and future supportability of the modified system." (8:60) One approach that seemed to work was to assign an Air Logistics Center (ALC) representative to the SPO and a SPO representative to the ALC. In addition, a Memorandum of Agreement (MOA) between the two commands "delineate[d] the responsibilities of each command and those which cross commands." (8:60-61) One of Klein and Smigel's interview questions addressed the question of split lines of authority and responsibility. The responses indicated this exists, and that it is a problem. They commented "Unless one of the two commands has been given the authority to transcend the

traditional functional and organizational boundaries separating the two, no one is tasked to perform an overall coordination function." (8:61-62) Klein and Smigel also found that the differences in management approach--project management in AFSC and system/item management in AFLC--were frequently mentioned by their interviewees. When multiple modification actions were underway, the coordination problem became even worse. (8:68) They concluded that "The requirement for a single manager responsibility, and enhanced inter-command [AFLC/AFSC] support, should be interpreted as the outstanding issue in the Class V modification process." (8:80)

Another study done in 1979, a thesis by McIsaac, continued the theme that effective communication and coordination is imperative. He also emphasized the importance of a single manager for the modification, suggesting several alternative lines of authority to accomplish this. (10:49-50,67) McIsaac recommended a new structure be established for the management of modifications, one which would form the single manager with budgeting, authority, and responsibility enough to coordinate the modification process for any one weapon system. (10:82) In effect, he was recreating the SPM structure with emphasis on modifications.

ARINC, a consulting firm hired by the AF Business Management Research Center, in 1980 completed a study that reached similar conclusions. In response to a question about the separate roles of AFLC and AFSC in modification development and implementation, ARINC found

. . . the real problem is believed to be caused by a lack of coordination, inadequate PMRT transitions, and less than desirable SPO/DPML [deputy program manager for logistics] and ALC/MAA [not defined] interfaces. . . although development and integration activities are separate and distinct, they must be managed in a cooperative manner, with constant communication and coordination by all involved . . . (2:3-7)

ARINC also found their respondents strongly believed that there should be strong centralized management "to ensure a proper AFLC-AFSC interface." (2:3-18) The authors looked at cause and effect of these problems, which are excerpted in Table 2 below. In addition to the cause and effect findings that resulted from the prime thrust of the study, ARINC reported numerous comments received from the 217 respondents.

CAUSES	EFFECTS	REMARKS
No single manager	Suboptimum integration of effort during development, acquisition & support phases	Logistics support-ability may be adversely affected
Inadequate communication and coordination.	Independent AFLC & AFSC solution of development & support phases	. . . can result in a lack of compatibility between development & support aspects of modification.
Travel funds not approved with modification funding approval	Inability to travel to perform necessary coordination.	

TABLE 2
AFLC-AFSC Interface Problems (2:4-2)

Many of these comments focused on the lack of a single manager for modifications, the lack of effective communication and interplay among the commands, the need for a modification master plan for each weapon system and the related need to group modifications into logical, time-oriented packages, and the opinion that the system manager lacks control over the assigned weapon system. ARINC recommended only that the single manager concept be further investigated. Although no specific techniques were suggested, this study did reinforce other studies reported here. (2:5-5)

A study done for ACSC in 1981 by Burleson, Daugherty, et al. further supported the needs described in previous studies in the form of a handbook on modification management. This was the first study that actually provided detail on who to coordinate with (by job types), what to work with them on, and about when in the process that the described coordination was necessary. It also described a number of the pitfalls common in the modification world, many of which have already been described here. The handbook provides a detailed explanation of funding for modification, and the coordination required to secure it. (4:--) Note that modification funds are provided according to type, with each type restricted to only certain uses, budgeted by different commands, and subject to different rules. This study provides an excellent handbook for modification management, with a detailed explanation of modifications and modification funding.

A study was done by HQ USAF in 1984 to develop a Class V Modification Improvement Plan. It was not documented in the conventional style, but briefing slides exist, and the briefer was available for interview during this author's previous study. The briefing recommended a single office at the headquarters be established as a focal point for Class V modifications, rather than run the development work through USAF/RD (now SAF/AQ) and the production and implementation through USAF/LE. The study also recommended that modification responsibility should remain with whichever command has PMR for the weapon system; AFSC nonconcurred with this because it would change the basic roles of the two commands. (30:--) The first recommendation continues the thread of a single focal point for modifications which several other studies have noted. The second recommendation is an institutional attempt to deal with the problems that exist in command interaction.

The final study reviewed was a thesis prepared by Bailey (the author) and Stalcup in 1984 for AFIT. This study developed a comprehensive conceptual model of the aircraft modification process. After modeling the process the authors identified key issues that drive the behavior of the process and its model. Among these issues were "the management approach to modification of aircraft, the management complexity associated with split management, and the personality dependence of the entire modification process." (3:112) The management approach used by the SPMs for modification management tended not to be a systems approach, that is, one that manages the overall system as it evolved over time. Instead, the approach tended to be to manage each modification according to its location in the process. Thus a modification to a radar set may be in the same category as an engine modification because they are both in the early planning stage. Other radar modifications may exist, but in different stages, and so are not grouped together. The issue of split management suggests once again the single manager concept. This study also concludes that some one individual must have final authority and responsibility for the modifications to the weapon systems, but that individual must have a thorough understanding of both AFSC and AFLC problems and their reasons for managing their problems the way they do. Personality dependence is another problem for effective modification management. While any management process can be expected to depend heavily on competent, committed people, the process should retain credibility in the system, not be based solely on certain strong individuals. The problem found in this study was that the system had very little credibility with its users, while they feared the loss of the critical individuals on whom they depended. This appeared to be at least partially due to an incomplete understanding of the process. (3:107-142) The Bailey and Stalcup study recommended each weapon system develop a "roadmap" or master plan for modifications,

establish mandatory training programs for managers involved in modifications, and establish a single authority point for each weapon system. (3:149)

The review of applicable studies has been long, but a careful examination of the trends of Air Force thinking over the long term of these studies will place the results of the interviews into perspective. Much progress has been made since that first study in 1973. Consideration of logistics supportability and the provision of qualified logisticians to the program offices are now givens. But the problems of split management, of inconsistent direction and regulations, of the need for master plans and MOAs seem to still exist, as the interview reviews that follow in section IV will illustrate.

III. THE LESSONS LEARNED PROGRAM

The Lessons Learned program was created to document either improved procedures that merit consideration or problems that should be avoided on future programs. The program is run by AFALC/LSL, Wright-Patterson AFB, OH 45433-5000, and may be accessed by writing them with a request or calling AUTOVON 785-3161. Lessons Learned (LL) are accessed using code or key words, and the resulting package of applicable LLs are sent to the user. The LL program was accessed for this study as one source of current Air Force thinking on modification management. The same themes appeared. One specific LL was "Close coordination between the Deputy Program Manager for Logistics (DPML)[in the SPO] and the item manager [in the ALC] increases the accuracy of cost estimates for Class V modifications," (24:3) pointing out once again the importance of command interaction. Another applicable LL addresses modifications to the ICBM force. There too is a problem of split management, but in the ICBM case the user is also involved in modifications and maintenance, so the interaction problem is between the ALC and SAC. The LL recommended assignment of a single manager who would be responsible for the interface. One LL proposed a solution to the significant command interface problem faced when a modification is planned to be installed on several different platforms. This solution is a Joint Management Team (JMT), on which are assigned middle managers from each of the platform management offices, whether AFSC or AFLC, the SPOs for the aircraft and the modification, the ALCs involved, and HQ AFSC. The purpose of the JMT was

to establish and maintain a formal communications link between the participating organizations, formulate basic interface management policies, act as

a formal organization for government review of interface documentation, and address various management issues as they arose. (24:23)

This LL's concept could easily work in the slightly less complex environment of one weapon system and the variety of modifications ongoing, planned, in development, in testing, or in production for that one weapon system. Numerous other LLs were provided which, although not worthy of individual mention, all included the need for strong interaction and communication between AFLC and AFSC in modification management. (24:--)

IV. INFORMAL INTERVIEWS

Informal interviews were conducted with managers from AFSC SPOs, AFLC ALCs, HQ AFSC, HQ AFLC, and HQ USAF. The interviews began with a brief explanation of the study and its purpose, and a few probing questions to get the person started. The goal was to get freely offered opinions of what is right and wrong with modification management, what solutions had been tried and how well they worked, where they saw problems with their counterparts in the other command (and vice versa: the attempt was made to interview direct counterparts) or with their own command, and what they thought might fix the problems. A completely new set of data was not attempted; rather, the purpose was to verify the previous studies' findings and the experience of the author. The choice of interviewees was based on first the weapon system, then the individual. The weapons systems were chosen on the basis of having achieved PMRT some years earlier, so that the ALC would have experience with the system, and so that a significant number of modifications would have gotten underway under the split management process introduced earlier. The individual interviewees were chosen on the basis of having some years experience with the system either in the SPO or in the ALC's SPM office, experience that involved the counterpart command. In order to achieve straightforward answers, anonymity was guaranteed. For that reason, interviewees will only be identified by the group to which they belong, and the group's interviews will be discussed together. The three groups will be AFLC managers, AFSC managers, and headquarters managers.

A. AFLC Managers.

The perceptions among the AFLC managers seem to vary somewhat in intensity and level of detail provided, but center on the same subjects identified in the previous studies of this subject. The main topics are problems with communications (sometimes with receptiveness to inputs), definition of the

relationship that does or should exist between the commands, the adequacy of relevant regulations and direction (PMDs), and the idea that success is personality dependent, rather than due to a good system or process. When asked about communications, two respondents perceived that the AFSC SPOs seemed unwilling to accept inputs, or were somewhat arrogant. The perceived attitude was one of "we know what's best for you, AFLC." (23:--). In some cases, they reported AFSC did maintain communications, but then pursued its own course regardless. Where communications seemed very good, there also was an MOA in existence which defined the relationship between the commands and established reporting and cross-coordination requirements. This was the case on the F-111 DFCS program. Although the MOA was never invoked, it existed and everyone knew it. The procedures it set up were followed. In another situation the reverse was true. No MOA existed, and the SPO seemed to ignore the authority of the SPM, which exists tenuously by regulation even if not defined in an MOA (paraphrasing the interviewee) (23:--).

The adequacy of regulations causes problems for the AFLC interviewees. As mentioned earlier, AFSC managers recognize the 800-series regulations as applicable. The 57-series regulations, bible to AFLC, is little known in AFSC. The interviewees reported problems with formats - modification program management plans (MFMP), for example, are subject to one format in AFR 57-4, and another (as program management plans (PMP)) in AFR 800-2. Another problem reported is that the 800-series regulations clearly state that the program manager is in charge, but AFR 57-4 says, through the configuration control sections and the total weapon system management approach, that the SPM has responsibility for integrating modifications. It is tenuous at best. Closely related to the problem of adequate regulations is the problem of PMDs that are consistent and compatible. One SPM said that PMDs ranged from vague and very basic, forcing the SPM and program manager to make up their own rules, to extremely detailed, leaving the managers no flexibility at all. It appeared to this individual that those who write PMDs have no training or guidance on how to write a PMD. Other problems with PMDs were the absence of any reference to the SPM as the single point manager, and the need for an overall weapon system PMD that established basic ground rules and authorities for all modifications. Currently for any given weapon system there may be dozens of PMDs in force, each for a different modification, with no apparent attempt to make them consistent or to relate one modification to any others. Another interviewee disagreed, saying that on his program the PMDs seemed to be improving, and becoming more integrated. He also commented, however, that the contractor

was integrator for modifications on his program, and that the Air Force really had no formal mechanism for keeping up with all the modifications.

Success in command interaction is dependent on the personalities and degree of commitment of the modification program managers and their counterparts, according to some interviewees. If those managers are committed to supportability, to making the modification work on the weapon system, not just while it's his or her watch, the interaction and coordination seem to work very well. One example cited again was the F-111 DFCS, where both the AFSC and the AFLC managers were very committed to making the interface work. However, if there's any sense of condescension from AFSC to AFLC, the interaction quality declines. Another interviewee cited a case where the SPO treated AFLC as an afterthought, approving documents in house and only then showing them to AFLC, too late for any comments to be made and incorporated. (23:--) This is unacceptable. The system needs to incorporate the ingredients of success, so that success is assured by following the guidance and direction, rather than by good intentions alone. One interviewee observed that the relationship between AFLC and AFSC should be

. . . like a doctor-patient relationship or lawyer-client relationship. AFSC is the expert, hired by AFLC to provide advice and counsel. But, AFLC has the right to choose not to follow the advice and accept the responsibility for the consequences. (23:--)

The exception to this approach, brought out by the same person, is when AFSC is developing a standard box to be installed on a variety of platforms. Then AFSC needs to define the relationship with each SPM involved, and the SPMs should back off and recognize the special problems of that situation.

Some miscellaneous comments were that modification PMRT had to be very carefully timed, to ensure that the SPO wouldn't be forced out of business before the residual tasks were complete. In at least one case the AFSC SPO did not appear to understand the need for supportability thinking up front. That was only mentioned once, however, so it was thought to be an isolated case.

B. AFSC Managers

The AFSC managers interviewed mentioned some of the same problems, but their responses indicated more variance in how serious the problem is. These managers also identified communications, definition of the relationship between the commands, and the dependence of success on the personalities involved and problems. However, they did not see that there was an inadequacy in regulations or PMDs. They agreed it is important for PMDs to be consistent, but felt that they generally were pretty good. There seemed to be less awareness of the inadequacies in the regulations, although at least one manager brought it up. Communications were perceived to be best where MOAs existed, as was the case in the F-111 DFCS, the F-111 Avionics Modernization Program (AMP), the F-15 program, and the Minuteman Program. In the latter case, the Program Management Plan (PMP) of the Minuteman Long Range Plan stated that it would serve as an MOA among AFSC, AFLC, and SAC. It also formally set up an organization which involved executive committees, steering committees and several working groups that were chaired by a representative from one of the commands. In the case of the F-15, the PMRT agreement served to define the relationship of the involved commands. All the interviewees who were working under agreements said that there was still conflict at times, but with the MOA (or PMP or PMRT agreement) in place, and the knowledge that everyone was working for the good of the weapon system, the conflicts seemed to work out without recourse to higher levels of authority. (25:--) This is similar to the comments made by the AFLC interviewees regarding the effect of MOAs on the working relationship. It is difficult in this set of interviews to separate the comments about the relationship between the commands from the communications between the commands. It seems that good communications depend, in most interviewees' minds, on how well the intercommand relationship has been thought out. Problems seemed to occur in communications only when contrary assumptions about procedures or authority (who's in charge) were possible. If those contrary assumptions could be made, then the problems were perceived as large. (25:--)

The AFSC interviewees recognized that success was dependent to a large degree on personality just as the AFLC interviewees did, but not to the same degree. Where the structure (due to an MOA) was clearly defined, they seemed to feel success was less personality dependent, although still true to some extent. They perceived that outstanding success would always be dependent on the individual's commitment to making the relationship between the commands work, regardless of the structure, but that having a well-defined structure reduced that dependence. One interviewee felt that the personnel selection criteria used were very important. He had been

selected as manager of a long range modification program specifically because of his experience and perspectives as an ALC manager. This suggests that some crossflow of AFSC and AFLC could have value for training modification managers. (25:--)

The AFSC interviewees did not have as much concern about the inadequacy of regulations and PMDs. There seemed to be a feeling that modifications are not all that different from regular acquisition, at least in the development process. One interviewee did note the conflict in formats for FMPs (or MPMPs). Another specifically responded that PMDs seemed to be consistent in quality, and appeared to reflect communication between the action officers in USAF/RD (now SAF/AQ) and USAF/LE. (25:--)

Other miscellaneous AFSC comments were made. One interviewee stated that while the relationship with the SPM organization was excellent, the relationship with the item manager's (IM) organization had significant problems. This was attributed to the fact that involvement with the IM's organization had taken place only at the lowest levels during the planning process. No mid-level managers were involved or identifiable. When problems arose, the lower levels buried them, and no pressure seemed to work to solve the problems until AFSC elevated the problem to the three-star level--at which point it was beyond any simple recovery. This manager recommended that any agreements (like MOAs) include the IM organization, but at a higher level than the IM. Another interviewee reported that one key to success in the F-15 program had been the assignment to the SPO of AFLC individuals whose performance was assessed by the SPM. (25:--)

C. Headquarters Managers

Only one interview at the headquarters level provided information relevant to the question of command interaction on modification management. This interviewee manages modification funding from the Air Staff, and has visibility into all significant ongoing modifications. In his view, the problems in modification management are lack of communication, lack of hard work, and a "not my job syndrome." He believes that there is nothing wrong with the process, that hard work will do the job, and backs that up by relating a case where he directed an ALC to use the basic, existing system to get a modification funded, rather than elevating the problem for special consideration. He said the modification was funded in six months, using the system, with lots of hard work by the managers involved. The importance of communication in getting a modification developed and implemented, he felt, could be

well illustrated by the Global Positioning System (GPS). The GPS user equipment will be installed on every operational aircraft in the Air Force, so it involves every ALC, three AFSC product divisions, and all users. Considering the need to fit on all aircraft, the desire for standard equipment to the maximum extent possible, and all the organizations involved, success is only possible with excellent communications and clear understanding of the responsibilities and roles of each organization. The GPS SPO has an MOA which defines the responsibilities and roles of the organizations. Both this interviewee and the SPM of one of the affected aircraft were impressed with the communications maintained with the GPS SPO. (11:--;23:--) As with the AFSC and AFLC interviews, there seems to be a connection between the existence of an MOA and the quality of the communication between the commands. The "not my job syndrome" he believes can occur anywhere, but it is particularly damaging between the two commands where communication and cooperation on modification programs is so important. When asked about PMDs, the interviewee stated that there's a mystique about PMDs that shouldn't be there. PMDs are just documents written by action officers that can and should be changed when necessary--they are "not chiseled in stone." (11:--) He agreed that lack of TDY funding is a problem for the AFLC managers, but said he couldn't seem to solve it at his level. He had included TDY funding in budgets previously, only to see it cut at higher levels or used for other things at AFLC level or below. (11:--)

While this interviewee's views are not representative of the entire headquarters, they do represent the experience of an expert in modification management whose current position exposes him to all the modification management problems. For this reason he was interviewed, and his thoughts included.

V. SUMMARY

This chapter has provided a comprehensive review of the regulatory guidance and previous studies and analyses that address modification management and especially the interaction between AFSC and AFLC during modification management. Selected LLs from the AFALC Lessons Learned Program and interviews with modification managers have been presented which show that the concerns raised in the studies over the years remain concerns today. Analysis of these data in the next chapter, in the form of issues, will show how it all fits together.

Chapter Four

ANALYSIS: KEY ISSUES

I. INTRODUCTION

With the information presented in Chapter Three, it is now possible to distill some key issues or problems that exist with the interaction between AFSC and AFLC. The preponderance of evidence says that AFSC/AFLC interaction is indeed critical. The nature of the relationship between AFSC and AFLC is not so easily pinned down. From all the examples in the studies, the LLs, and related by the interviewees, as well as the other examples known to the author, it appears that the relationship between the commands varies according to the needs of the individual weapon system and even according to the needs of the individual modification. Only the fact of split management, and therefore the criticality of the interaction between the commands is constant from example to example. The issues, then, center on how to optimize this interaction to ensure that management of modifications is as successful as possible. Discussed below are the following issues: definition of responsibilities and authority, communications, adequacy of existing guidance documents, and the dependence for success on the personality of the manager.

II. DISCUSSION OF THE ISSUES

A. Definition of Responsibilities and Authority.

Analysis. The issue of definition of responsibilities and authority encompasses the problems of split management and "who's in charge." It also ties to the next issue regarding the adequacy of the guidance. The roles and responsibilities of AFSC and AFLC are generically defined in the various regulations reviewed earlier, and usually further defined in the PMDs. Over the years of studies, many have suggested establishing a single manager for modifications (assumed to mean for each weapon system, versus one for all modifications everywhere). The problem seems to lie with three missing things: 1) a specific statement of who has authority over

what, 2) the understanding of each other's responsibilities, and 3) agreement on both. In each of the cited examples (GPS, F-111 DFCS, F-111 AMP, F-15, Minuteman) where an agreement had been formalized, the organizations involved had worked out for themselves who had authority and who had responsibility for what. The result, at least at the manager's level, seemed to be a clear understanding of the unique roles and responsibilities of each other's organization.

Possible Solutions. Three different approaches could reduce or solve the problem. The radical solution would be to combine AFSC and AFLC, so that the single authority of the commander of the joined commands could rule. Aside from the unlikelihood of this proposal ever being accepted, it really wouldn't work. The current organizational structure has all the ALCs under AFLC, but that doesn't keep the ALCs from having problems with the relationships among themselves. Another less radical solution would be to rewrite the applicable regulations, strengthening the division of roles, responsibility, and authority. The rewritten regulations would then eliminate the uncertainty and ambiguity that exists today. This solution would be far more acceptable than the first one. But, it seems that the successful managers work it out for themselves under current regulations. Rather than over-riding a system that can (and has) worked by rewriting regulations to define roles, responsibility, and authority, perhaps the more reasonable approach would be to add to the regulations a requirement to effect an agreement of some kind between the AFSC SPO and the applicable AFLC ALCs, both SPMs and IMs. This way a technique that's been shown to work is mandated, but the mechanics, which are unique to each modification, can be worked out to suit the situation. Furthermore, it tends to drive the solution downward to the managers who know those unique features, rather than elevating it to the headquarters level. This would make the solution more acceptable to the managers (AFSC and AFLC). It would also eliminate the potential need for waivers to accommodate unique situations that simply could not fit into a mandated solution.

B. Communications.

Analysis. While it is clear from the studies and interviews that close communications between the commands is vitally necessary, it isn't easy to mandate it. However, it was also evident from the studies and interviews, as well as the author's experience, that good communications seemed to accompany the existence of an MOA. What is not clear is whether a cause and effect relationship exists between MOAs and good communications--either way. It is reasonable to

assume, however, that the interplay necessary to create an MOA could only improve the communication environment, since the participants would be clarifying roles, responsibilities, and authority. This would serve to eliminate erroneous assumptions and bring into the open all the tasks to be accomplished by the two commands. Therefore, the alternative of mandating an MOA to be accomplished by the participating managers seems to be applicable to communications as well. Another technique used by some programs is to create a long range plan or master plan for the weapon system. This too seemed to improve communications, as long as anyone preparing modifications for incorporation into the system was included in preparation of the master plan. There tended to be frequent updates to the plans, due not only to problems in development but also to budget problems and requirements changes. The update process improved communications even more, or at least drove recognition of ripple effects on other modifications or on the weapons system, which after all is the goal of better communications. Finally, there is the technique of establishing executive committees, or steering groups, with subcommittees and working groups to carry out the taskings of the higher level committees. With members at each level from all the participating organizations in AFLC, AFSC, and the using commands, and sometimes from the headquarters, communication is enhanced by the periodic meetings and by the subsequent follow-up actions. A final proposal would be simply to emphasize the need for good and regular communication through training courses, commanders tips, inspector general tips for program managers, and handbooks or pamphlets that address management of modifications. This is actually already being done to some extent--the AFSC Chief of Staff sent out a brochure in 1986 with some pitfalls for the program manager to avoid. One of them was focused on the need for communication and involvement of the participating commands in any program, whether modification or pure acquisition. (27:23)

Possible Solutions. Unlike the alternative solutions for the first issue, the alternatives for improving communications are not mutually exclusive. There may be certain minimum actions. For example, the MOA approach seems to work under any circumstance. It is flexible enough to be used even on fairly small programs, or on very big, complex programs with many organizations involved. Making it mandatory would ensure a certain minimum level of communication. Emphasizing the need for good communication will always be necessary. It is basic to training new managers, who are always coming along, and it can always help to review the subject with experienced managers. These two approaches fit well together, and seem to be minimum solutions to the problem. If the problem is very complex, with multiple modifications coming at many different times from a variety of organizations, then the master plan or

long range plan would be suitable. If there are very few modifications planned, then a comprehensive plan may not be necessary. The determination whether to use one could be left to the SPM or directed in the PMD. Formats for plans, again could be left to the SPM, or included in a regulation such as AFR 800-2. Establishing committees might be considered the next step up in complexity and size, although it certainly could be done concurrently with master plans and MOAs. All four actions could apply to a single program, although the F-15 and Minuteman example programs replaced MOAs with the more extensive PMRT plan and PMP respectively.

C. Adequacy of Guidance Documents.

Analysis. The problem of adequate guidance documents is divided into two parts: regulatory guidance and program unique guidance (PMDs). The regulatory guidance can be further categorized into regulations, which are binding, and pamphlets, which are advisory. There are some inadequacies in the regulations. Primarily, the problem is that most related regulations almost completely ignore modifications. The big exceptions are AFR 57-4, which comprehensively describe the types of modifications and the approval process, and AFR 57-7, which describes in detail the funding documents for modification. (17:--; 18:--). AFR 800-2, as described earlier, barely mentions major modifications in its statement of scope, and never again addresses any of the unique aspects of modification programs. (20:1) The problem, therefore, is the unique aspects, requirements, and problems of modification management are not addressed in the regulations. Another problem in the regulations is the absence of authority for the SPM. AFR 57-4 states that the SPM has the responsibility for integrating modifications after PMRT (17:5), but nowhere does the regulation assign the authority for integrating decisions to the SPM. The pamphlets yield more, but they only provide advice. AFSCP 57-2, Modification Management, does provide information and advice on modification management for the AFSC manager (not to the SPM), but not any specific techniques for implementation. (26:--). It is also seriously out of date, having been last issued in 1982, which is before AFSC began managing many Class IV modifications. AFLCP/AFSCP 800-34, which is at least joint, provides advice on Class V modifications but totally ignores Class IV modifications, and does not provide any suggested techniques. It is a current document, with an issue date in 1987.

Program Management Directive. The second guidance document that is frequently inadequate is the PMD. PMDs are written by the action officers at USAF/LE and SAF/AQ to

provide specific direction, funding, and required schedules to acquisition and modification programs. A separate PMD is usually written for each modification program. If the modification is a Class V modification program originated by AFSC with development work involved, then SAF/AQ normally writes the PMD. If it is a Class IV modification, or a Class V modification in production, USAF/LE normally writes the PMD. Exceptions exist to both of these. The problem is that there appears to be little or no coordination between the action officers from PMD to PMD. No overall PMD is issued to override all the modification PMDs and provide the SPM with baseline direction and priority of modifications. Nor is there any basis for requiring the various modification program managers to accede to the SPM. (23:--) Nothing ties all those modifications together, and so the various modification program managers point to their own PMD as justification for actions and decisions. Another problem with PMDs is they either give too little detailed direction, which is therefore too vague for the SPM, or provide far too much detail, which takes away the SPM's flexibility.

Possible Solutions. For the regulations, fairly minor changes to the regulations could extend applicability, and provide a basis for some of the actions suggested previously. For example, the requirement to develop an MOA between the AFLC SPM and the AFSC SPO could be included in both AFR 57-4 and AFR 800-2. The alternative would be to put the requirement in AFR 57-4 only, and have AFR 800-2 strongly reference AFR 57-4 for the management of modifications. Similarly, addition of authority assignment to the SPM could be a one or two word addition to page 5 of AFR 57-4. As it happens, the Goldwater-Nichols Law has forced many of these regulations into revision. Incorporating minor changes to make them compatible with each other should not be difficult. The updates to the pamphlets AFSCP 57-2 and AFLCP/AFSCP 800-34 should be considerably more comprehensive. For example, inclusion of Class IV modifications as work that may be done by AFSC requires a new addition to both. Also, AFSCP 57-2 would probably be improved if it were made joint with AFLC. Then it could draw on the expertise of AFLC to ensure its correctness, and provide advice to the SPMs on modification management. With some additions, these new joint pamphlets could provide to SPOs and SPMs advice on working together and assuring good communications.

Two suggestions could alleviate the problems with PMDs. One would be to begin issuing an overall PMD for each weapon system that tracks to the philosophy of the master plan. This "master" PMD would override any other PMDs for modifications for that weapon system. A standard level of detail should be maintained, to allow significant flexibility, but the

authority of the SPM should be clearly established with regard to changes to his or her weapon system. This would immediately remove the unsolvable conflicts, but hopefully it would also influence the various action officers to bring the PMDs for which they are responsible into line with the overall PMD, and to become involved in the issuance of each other's PMDs. The second suggestion is to establish some standard or operating instruction for the issuance of PMDs. If properly written, it could strike a good balance for the level of detail required in a PMD.

D. Personality-Dependent Success.

Analysis. It was frequently mentioned in the studies and interviews that successful interaction between the commands depended heavily on the personalities of the managers assigned at AFSC and AFLC. If the AFSC manager was strongly committed to making the interaction between the commands work, it usually did work, assuming the AFLC manager was similarly involved. If the AFSC manager had a case of the "not my job syndrome," there was generally little interaction, and significant problems with modification integration resulted. The AFLC manager has two problems. He or she must not only be committed to making the modification program work, but must have sufficient TDY funds available to travel to the necessary meetings. The problem of sufficient TDY funding was raised by several of the studies reviewed, as well as by the managers interviewed.

Possible Solutions. In order to get managers committed to a way of doing business, they must first be informed a method exists and secondly be convinced the method is beneficial to their program's success. This suggests that training managers specifically on modification management would be advisable. This could be incorporated into the existing program management training, the AFIT courses SYS 100, 200, and 400. It could be a one or two day course by itself, or be made into an Extension Course Institute (ECI) program, to be taken by correspondence. This approach is direct, but it would require justification to develop another course, time to develop the course chosen, and time to cycle the managers through the training. Unless the training was made mandatory (unlikely since it is not unique to any one career field), there might not be enough interest to get the program managers to attend the course. Another approach, given the update and upgrade of the pamphlets suggested earlier, would be to call out those pamphlets in the PMD as related documents for the manager to use for advice in modification management. The pamphlets could at least be made freely available (not restricted in distribution like regulations) at the AFSC product divisions

and at the ALCs, and incorporated into job specific training. Using the pamphlets, once upgraded, would be much simpler and less expensive (intuitively) than developing and administering a training course. These suggestions cannot totally remove the personality dependence of success in modification management and interaction, but they can reduce the disparity between the committed, knowledgeable manager, and the less committed but at least knowledgeable manager.

III. SUMMARY

This chapter provided a discussion of four issues and some alternative suggestions for resolving those issues. To meet the need for definition of responsibilities and authority (the first issue), the suggestion that seemed to be the most acceptable was to require all AFSC modification program managers to establish an agreement with their AFLC counterparts, both SPM and IM levels. That agreement would define the roles, responsibility and authority of each participant. For the second issue, to improve communication between the commands, four suggestions were made. The first two, mandating that an agreement be made between the commands, and emphasizing the need for regular communication in publications and training, would be applicable to all modification programs. The next two, establishing a long range or master plan for the weapon system, and establishing steering and working committees, would be used if the complexity of the weapon system planning warranted it. The third issue, adequacy of guidance documents, could be resolved by making some minor changes to the regulations, updating and expanding the existing pamphlets on modification management, and for PMDs, issuing an overall PMD for each weapon system and writing an operating instruction or standard for the action officers to use while preparing PMDs. Resolving the fourth issue, the personality dependence of success in modification management and interaction, can be done by providing training via the upgraded pamphlet, which would be freely available to modification managers. In the next chapter this study will be summarized, conclusions drawn, and the recommendations presented.

Chapter Five

CONCLUSIONS AND RECOMMENDATIONS

I. INTRODUCTION

The study began with a question of whether guidance could be provided to facilitate the interaction of AFSC SPO personnel with AFLC SPMs during the AFSC development and production of Class IV and Class V modifications to weapon systems under AFLC control. Four objectives were established to guide the work. This chapter concludes the study by examining whether the objectives were met and the question answered. Furthermore, it provides recommendations for improvements in the process of modification management which will facilitate the interaction described above.

II. CONCLUSIONS

A. Nature of the Relationship.

The first objective was to determine the nature of the relationship between the commands. It turns out that there is no one way to describe the relationship between the two commands. Each modification program has unique features which translate into a unique relationship between the AFSC SPO and the one or more AFLC ALCs involved. For example, the F-111 DFCS modification would on the surface require a simple relationship between the Sacramento ALC and the Aeronautical Systems Division (ASD). However, the new computer needed information from several other systems in the aircraft that were otherwise uninvolved. Therefore, the IMs for each of those systems entered the relationship, involving two other ALCs. Then it turned out that two of those systems were under development, so the appropriate SPOs became involved. Finally, the support of the DFCS involved the ALC that is SPM for the support equipment, and the ALC that manages the simulators. A total of four ALCs (five different offices) and three SPOs were involved in the relationship. After looking at some other programs, the DFCS actually was a fairly simple relationship. It quickly became obvious that determining a

single relationship to meet this objective could not be achieved in the scope of this study. However, it also became apparent that solving the problem of interaction between the commands did not depend on defining a "standard" relationship between them. Therefore the answer to this objective is to recognize the uniqueness of each relationship, and permit the rest of the study to find a way to deal with the fact of uniqueness.

B. Current Regulatory Treatment of Modifications.

The second objective was to examine the treatment of modifications by current regulations. Current handbooks, pamphlets, and manuals were also examined. This objective was met. All Air Force, AFLC, and AFSC regulations, manuals, handbooks and pamphlets that could possibly relate to modifications were briefly reviewed, and the ones that mentioned modifications were reviewed in more depth. Those that addressed or should have addressed the relationship between AFLC and AFSC were reviewed in Chapter Two. While the objective was met, no current regulatory guidance was found to adequately treat AFLC/AFSC interaction.

C. Investigation of Current Air Force Thinking.

The third objective was to investigate current Air Force thinking to determine whether command interaction is considered a problem. This objective was addressed in two ways. First, an exhaustive search of studies, analyses, and articles on modification management was conducted. This confirmed the existence of a problem over time, exposed some related issues, and added dimension to the problem. Then informal interviews were conducted with a selected number of managers of modifications at the AFLC ALCs, in AFSC SPOs, and at Headquarters Air Force. The interviews were used to determine whether current managers still saw the problems reported in the studies. This objective has been met. However, more than the limited number of interviews possible given the time constraints could improve the study and provide greater certainty.

D. Recommendation of Changes to the System.

The final objective was to make recommendations for changes to the system. This objective was approached by formulating issues, from the studies and the interviews. For each issue alternative ways to resolve the issue were

suggested and discussed. For each issue some viable alternatives exist, and will be presented as recommendations in the next section of this chapter. The final objective will then be met.

III. RECOMMENDATIONS

The recommendations presented here are organized according to the issue each addresses. Therefore, each issue is briefly summarized as introduction to the recommendations that apply to it.

Issue: Definition of responsibilities and authority. The responsibilities and authority of the participating organizations is not clear from the regulations and other guidance, due to the uniqueness of each modification program.

Recommendation: Add either to current applicable regulations or to every modification program PMD a requirement to prepare a written, signed agreement between (among) the AFSC and AFLC organizations.

Issue: Communications. Close and regular communications between the commands and among the participating organizations is vitally necessary and frequently inadequate.

Recommendations:

1. Require all modification programs to enact an agreement (same as the first recommendation) through a change to regulations or PMD direction.
2. Emphasize the need for good communication in management training courses, articles in command publications, inspection team tips, and handbooks or pamphlets on modification management.
3. If the SPM or AFLC Headquarters determines it necessary due to complexity, develop a long range plan or master plan for the weapon system, encompassing all modifications and signed by all organizations involved in managing modifications for that weapon system.
4. Where determined necessary by the SPM or Headquarters AFLC, due to complexity of the planned modifications, establish a system of committees, such as a steering committee, an executive committee, and working groups that involve the relevant organizations.

Issue: Adequacy of guidance documents. Both the regulatory guidance and the PMDs have inadequacies. The regulations failed to address modifications at all in some cases, the pamphlets were out of date and/or need expansion, and the PMDs were disjoint.

Recommendations:

1. Add to the applicable regulations the requirement for MOAs, the provision for long range or master plans along with a format, the provision for a system of committees, the authority of the SPM following PMRT, and the missing information on current management of modifications. Modify the regulations to make formats consistent. The choice of which regulations to change belongs to the Office of Primary Responsibility (OPR) for the regulations, but the changes should be coordinated among the OPRs for the related regulations.

2. Revise and expand the existing pamphlets on modification management to recognize current trends, include regulation changes (including the above recommended changes) and include suggested techniques for improving interaction between the commands.

3. Establish a policy to issue overall PMDs for each weapon system. The overall PMDs should establish the modification philosophy and authority chain for that weapon system.

Issue: Personality-dependent success. Currently successful interaction between the commands depends heavily on the personalities of the managers involved. This suggests that the system does not currently provide the means for successful interaction.

Recommendations:

1. Implement the recommendations above to provide the basic structure for successful interaction.

2. Make the revised pamphlets freely available and part of job training for managers in AFIT, in SPOs, and in SPM and IM offices.

The recommendations provided above make small improvements on a basically sound system. Many SPMs and program managers have already discovered and successfully used many of the techniques suggested. The purpose of the recommendations is to provide an institutional framework within which all managers can more easily be successful.

The final task, then, is to answer the research question. Can guidance be provided to facilitate the interaction of AFSC SPO personnel with AFLC SPM managers during the AFSC development and production of Class IV and Class V modifications to weapon systems under AFLC control? The recommendations provided above answer the question "yes," and provide the "how" as well.

Success in modification management is becoming more important than ever as the Air Force relies on it more. One of the sponsors of this study, the Assistant Deputy Chief of Staff for Product Assurance and Acquisition Logistics, estimates that "70-80 percent of the aircraft on the ramp today will be active for another 20 years." (25:--) That means even more modifications will be programed to keep those aircraft current. We need to succeed in modification management to maintain and improve our capability to defend the nation. With the few changes recommended by this study, the potential for success improves.

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