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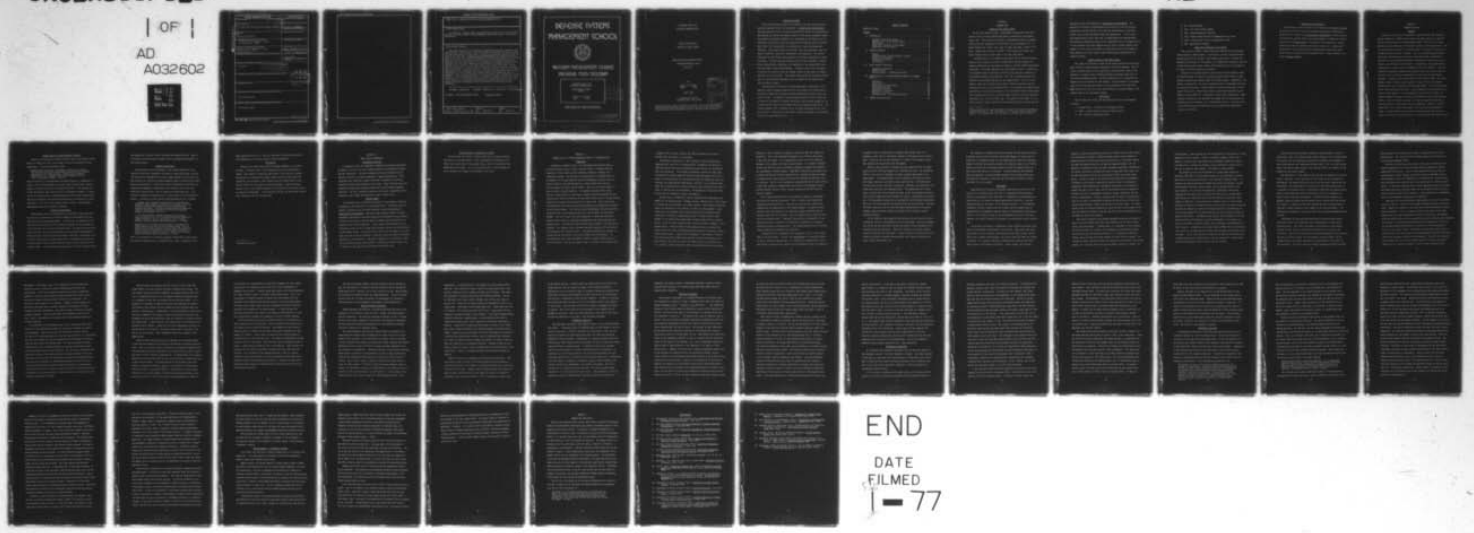

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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE: A SYSTEMS VIEW OF AN AIR FORCE PROGRAM OFFICE

STUDY PROJECT GOALS:

To construct a systems model of an USAF Program Office and its environment. Attempt to project changes in the management organization because of changing environment.

STUDY REPORT ABSTRACT:

This report identifies and analyzes

The major elements of an Air Force Program Office have been identified and analyzed from a systems view. First the existing regulations and documentation of program management were reviewed. Then, using the analysis approach suggested by Kast and Rosenzweig in 'Organization and Management', the program management world was divided into elements for analysis. To facilitate analysis, a boundary about the program office was constructed which separated the program office elements from their environment. The environment was analyzed from the general (societal) and task basis depending on how directly the program office was affected by the element. As an open system, the program office must interact with its environment. This is done with boundary spanning documents, products, and organizations. The program office itself was analyzed in terms of its major subsystems: goals and values, technical, structural, psychosocial, and managerial. The emphasis in the analysis was on people with various leadership styles, examined. Finally some projections to the future were made by examining current changes in the environment which is a moderated variable. The two most significant are: (1) an increasing trend toward matrix management rather than a vertical, monolithic organization; and (2) the new controlled OER resulting in increased personnel management issues particularly in recruiting and job appraisals.

KEY WORDS MANAGEMENT CONCEPTS PARTICIPATIVE MANAGEMENT SYSTEMS ANALYSIS

KEY WORDS: PROGRAM MANAGEMENT MODEL PROGRAM MANAGEMENT

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DEFENSE SYSTEMS MANAGEMENT SCHOOL

PROGRAM MANAGEMENT COURSE
INDIVIDUAL STUDY PROGRAM

A SYSTEMS VIEW OF AN
AIR FORCE PROGRAM OFFICE

STUDY PROJECT REPORT
PMC 76-1

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A SYSTEMS VIEW OF AN AIR FORCE PROGRAM OFFICE

Study Project Report

Individual Study Program

Defense Systems Management School

Program Management Course

Class 76-1

by

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April 1976

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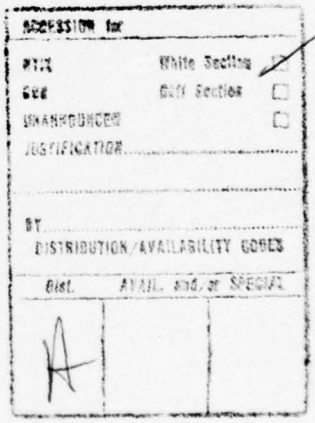

EXECUTIVE SUMMARY

An Air Force Program Office can be modeled as an open system using the approach suggested by Kast and Rosenzweig, in Organization and Management. The resulting model offers a powerful and realistic vehicle for understanding and managing the complex and dynamic aspects of the program management domain. The concept of permeable boundaries is a cornerstone of the model; since it determines the extent to which the program office interacts with its environment, while still maintaining its own identity in terms of autonomy and stability. The program office can be broken into five subsystems: goals and values, technical, structural, psychosocial, and managerial. The various subsystems are not distinct and separable, but interact dynamically to shape the others. The most important element within all the subsystems is people. Proper understanding, motivation, and leadership of the program office are real challenges to the Program Manager. Leadership styles vary from person to person, but flexible styles are needed to adapt to variations in subordinates and in the situations. The program office people and situations demand more of a participative management style as opposed to the authoritarian styles needed in combat.

The application of the Kast and Rosenzweig model as described in this paper may soon be outdated because the Air Force seems to be moving back toward matrix organizations where key program participants remain in the functional offices. The heyday of the big program offices in the Air Force may be over with the advent of manpower reductions, and the tough competition for limited top efficiency ratings between equally outstanding professional. The Program Manager's job is probably one of the most challenging the Air Force has to offer in peacetime, but the mental and physical demands are tremendous. Yet, that is where the action is.

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SECTION I

INTRODUCTION

Purpose of the Study Project

An Air Force program office is many things to many people with each person's point of view depending upon specific perceptions, experiences, values, etc. This report will provide an unconventional view of a program office which will complement the traditional view, yet expand on it. As Humpty Dumpty said, "When I use a word, it means just what I choose it to mean - neither more nor less" (10:746).[1] After reading the report, the words "program office" should "mean" a lot more than before.

A program office is an organizational entity that is tasked to design, develop, test, produce, and field a system within defined schedule and funding constraints for the purpose of meeting a national defense operational requirement. The image created by the term "program office" is usually one of a permanent team of functional specialists that operates according to prescribed standards and regulations. This view is commonly held by both outsiders and the people who work in the Program Office - and it is true. However, there are a myriad of other ways to view the functions and relationships that exist in any program office. As an example, the organizational activities can be viewed on the basis of (a) functional elements (engineering, test, program control, etc.), (b) end products (reports, pieces of hardware, knowledge, etc.), or (c) in other ways. The purpose of this paper is to examine a typical, large, vertical Air Force program office using the approach

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[1]This notation will be used throughout the report for sources of quotations and major references. The first number is the source listed in the bibliography. The second number, when included, is the page in the reference.

advocated by Kast and Rosenzweig in Organization and Management. This analysis will provide a fresh perspective from which to view the actions, interactions, and motivations of not only the organization as a definite entity, but also the individuals within the organization. It will assist the program manager and his key staff in understanding the organizational and individual complexities which are an inseparable part of a program office. If this different view helps someone avoid or solve a single program office problem, it will justify the author's writing time as well as the reader's time; because, few things cause as much inefficiency as organization and "people" problems.

Specific Goals of the Study Project

This study will construct a model of the program office and its environment, using the systems approach advocated by Kast and Rosenzweig. Specifically, a systems model will be constructed by tailoring their ideas to the elements of a program office including the major subsystems which exist in the program management domain. The model boundaries will be specified and boundary spanning elements will be examined. The environment of the systems model will be discussed and trends in the environment will be identified. Both actions will give rise to the identification of possible changes to the systems model as the environment changes.

Definitions

The following definitions and abbreviations will be used throughout the paper.

1. Program Office - A large Air Force program office.
2. DSARC - Defense Systems Acquisition Review Council.
3. DCP - Decision Coordinating Paper.

4. PM - Program Manager.

5. AFSC - Air Force Systems Command.

6. PMD - Program Management Directive.

7. PEM - Program Element Monitor at Headquarters, Air Force.

8. SYSTO - System Staff Officer at Headquarters, AFSC.

9. DOD - Department of Defense.

Scope and Limitations of the Report

This report will model a large vertically organized Air Force program office managing a DSARC program. In particular, the Full Scale Development program phase will be examined. Other phases would result in subtle, but substantive differences in the modeling. No attempt will be made to construct a time-varying dynamic model; rather, the program office will be assumed to be frozen in time for purposes of analysis.

Because of the subject matter of this report, and the attempt to make the resulting model as specific as possible, general applications to other program situations may readily result in different models. Additionally, the author is viewing the issue from a perspective that is inescapably biased by his personal experiences. He has worked for more than three years in what the Air Force calls a "Super SPO", during a period that extended from pre-DSARC II to past DSARC III. Perceptions, values, goals, motivations, organizational interactions, and objectives may change with the organization and certainly with time; however, it is believed that there is sufficient merit in the current baseline analysis and it can be adjusted to accommodate a variety of conditions.

Organization of the Report

The following section, Section II, will describe the present situation as defined by official Air Force publications and personal observations. Section III will outline the study project's methodology including Information Gathering, Analysis Model, and the Environment - A Moderator Variable. In Section IV the main thesis of the paper will be developed via a model based on the analysis technique described in Section III. Attention will be devoted to the boundaries and the interpersonal relationships which exist within the subsystems of the program office. Finally Section V will contain summary comments.

SECTION II

PRESENT SITUATION

General

A search of the official literature for the definition, the objectives, and the concept of a program office almost invariably results in a description of the functions of the Program Manager (PM). The next tier of documentation usually addresses the structural elements of the organization. That is, the definition of "what is a program office" is described in terms of an "organization and functions" document. This is a standard approach because traditional management theories which we have been taught, particularly in the military, have advocated structured relationships of authority, span of control, and functional specializations. Consequently, organization charts reflect what is tangible, can be diagrammed, felt, and inspected. There are significant management changes being pursued and put into action within the Air Force, but the official documentation is still more the traditional approach. Certainly, with the publishing of DOD Directive 5000.1 the single manager concept for major weapon systems is a way of life, and everyone recognizes this at all levels in the DOD establishment. Air Force Regulation 800-2, which implements DODD 5000.1, clearly emphasizes the responsibilities of the Program Manager. In the Aeronautical Systems Division (ASD), the program management concept is clearly established for large vertical program offices. Each of the major programs is a separate Deputate within ASD as are the functional organizations such as engineering. Nowhere in the ASD regulations is the "single DOD manager" for a major system emphasized in words. The descriptions of the various organizations and their missions, which are covered in ASD Regulation 23-1, are discussed on the following page.

Command Section (Program Manager's Office)

Typically, the description starts with the title of "XXX System Program Office" or "Deputy for XXX", and includes a list of the functions of the organization. The usual description reads:

> Manages (plans, organizes, coordinates, controls, and directs) the collective actions of participating organizations in planning and executing the system program. Proposes and/or prepares modifications of or changes to the system program within the limits of guidance received. (1:12-3)

Note that nothing is said about whom the Program Manager is responsible to. However, the Division Commander or the next level in the military chain of command is shown at the top of the organization chart. This confuses the "single DOD manager" idea since there are no explanatory comments. A great deal of the relationships are implied because of the military command chain, and other coordinative and reporting relationships are spelled out in other regulations. This then is the program manager's office. The following paragraph describes the subordinate elements.

Classical Directorates

Most program offices are subdivided into functional directorates which are made up of people who are formally assigned to the program office and work directly for the program manager. In some cases, as engineering, the specialists work directly for the functional Deputate, but are assigned on a full-time basis to a particular program office. The typical large program office will have five to eight Directorates like Configuration Management, Program Control, Integrated Logistics Support, Production, Procurement, Test, or various combinations of these Directorates. No Engineering Directorate is shown because it does not fall under the formal chain of command of the program manager. The Directorates are described in a fairly straight-forward

and general way in terms of their functions and responsibilities. There is a relatively new Directorate, Projects, that is becoming more prevalent in the large programs.

Projects Directorate

The existence of this Directorate in most larger programs is a key indicator that project management philosophy is being passed down, not only from the Division Commander to his major program managers, but also the program managers are turning to project management ideas and complexities within their own organizations. Within this Projects Directorate, individuals are charged with management of subsystems; which requires them to cross the traditional organizational lines to accomplish the assigned tasks. The strongest statement of responsibility is usually found in this Directorate's charter. A sampling of these charters from ASD Regulation 23-1 includes:

> ...Assumes total management responsibility to interface and integrate primary supporting systems and subsystems within the XX system on compatible schedules and within established funding limitations. Provides the System Program Director with constant intermediate management of critical XX supporting systems and subsystems. (1:17-5)
>
> ...This responsibility includes managing the development, test, and acquisition of all hardware/software sub-systems and support elements of the XX weapon system (i.e., airframe, avionics, engines, weapons, and AGE/Simulators)... (1:18-2)
>
> Responsible to the System Program Director for management of system elements that comprise the XX weapon system. This responsibility includes managing the acquisition and integration of all elements and subsystems of the XX weapon system to include the airframe, engines, missile, avionics, and electronic warfare (excludes logistics resources). (1:20-1)

There is this dynamicism in program management, exemplified by the Projects Directorate management scope of responsibilities, that is happening in the

major program offices, but is not well explained in the directives and not well understood by even those working in that environment.[1]

The Problem

Because of the complicated nature of program mangement, this author believes a "different view" of the program office and its functioning is needed. Some editorial license has been taken in the simplistic standard description of a program office above, because there are other governing regulations and directives, like AFR 800-2 and AFSC Pamphlet 800-3, that help to "flesh out" the process of program managment. These directives, however, focus on the elements external to the program office and the process of acquisition management. In the following section, the model used to build that "different view" will be described.

---

[1]Personal observation.

SECTION III

STUDY PROJECT METHODOLOGY

Information Gathering

A literature review was conducted to identify the pertinent Department of Defense, Air Force, Air Force Systems Command, and Aeronautical Systems Division regulations. They were augmented by various technical and professional articles on program management in complex organizations. Also, interviews were conducted to gather additional information on the basic concepts and ideas being examined in this study. These interviews were with selected individuals who occupy key DOD and Air Force program management positions. The final information source was the author's experiences while assigned to the Projects Directorate of a major program office.

Analysis Model

The information was collected on the basis of the elements, functions, interactions, and constraints in the program office. The analysis was conducted in accordance with the model described in Kast and Rosenzweig's Organization and Management. Basically, their approach defines a program management organization as an open system that has boundaries which separate it from its environment, and yet contains elements which deliberately and necessarily span these boundaries. In this paper, the environment will be described in terms of how it shapes and influences the make-up and functioning of the program office. The program office itself will be treated as a system made up of the following subsystems - technical, goals and values, structural, psychosocial, and managerial. The paper's objective is to construct a model of the program management office based on interactive, dynamic systems view in contrast to the stable process-oriented traditional view.

The Environment - A Moderator Variable

The interviews and current literature were used to identify changes, particularly in the environment. These environmental perturbations will affect the systems model of the program office, and will necessitate some adjustments to the model. As in any on-going process, the challenge will be to recognize the changes as they happen in real time.

SECTION IV

CONSTRUCTION OF A SYSTEMS MANAGEMENT MODEL OF A PROGRAM OFFICE

Boundaries

To describe a program office, is a challenging task because there is no finite beginning, end, or even a physical entity. A program office is comprised of ideas, people, goals, buildings, products - whatever one's imagination decrees. For the sake of communication, this "Wonderland" will be thought of as having boundaries which are permeable, but which serve to focus thinking so the imprecise media of written English will not be a barrier between the author and the reader. There are an infinite number of ways to define a systems boundary. The commonest boundary which circumscribes a program office is that which includes government employees who are located within physical proximity to each other and who work on a single defined program which occupies the vast majority of their time. Add to that group, any individuals who might by physically (geographically) separated, but report to the Program Manager. The first condition acknowledges that some functional specialists work in the program office; yet, do not report to the Program Manager. This still leaves out those exceptions in which some functional portion of the program is conducted independently both organizationally and geographically. The model will define these latter elements to be outside the boundary. The elements within the above described boundary will be dissected and analyzed as the "program office". The greater proportion of elements is located outside the boundary, and will be labeled the "environment". In the subsequent section the environment in which a program office must exist will be explored. Now that an image of what is included in and excluded from

a program office has been created, this same viewpoint will be used to ascribe other attributes to the boundary.

The concept of boundaries is very important to the functioning and organizational viability of a program office. Boundaries are the key to stability because they define appropriate system activity and interactions with the environment. "The boundary constitutes a barrier for many types of interactions between people inside and outside the program office but it plays a facilitating role for the particular types of transactions that are necessary for organizational functioning". (18:114) It is literally impossible for a program office to function without some filtering of the stimuli which it receives from its environment. The boundaries are two way filters for the flow of information, energy, and material.

Several types of "boundaries" must be recognized and respected by the members of the program office. Probably the most important one is the concept of "committing the government" to a legal contract. Only certain specialized people are permitted to sign contracts on behalf of the government. Sometimes there are exceptions, but, these actions must be ultimately either recognized or denied by a contracting official. Closely allied to this example is the handling and disbursement of public funds which are covered by law. These are clear boundaries that limit the actions of members of the program office. There are other fiscal examples such as only committing funds to activities that are allowed within the bounds of the yearly Congressional appropriations. Another set of boundaries is delineated in the Decision Coordinating Paper (DCP) which specifies normative performance, cost, and schedules, but contains a series of ranges (usually a one-sided range, i.e., +delta$, -delta performance, +delta schedule) within which the program

director is free to manage his program, as long as he does not surpass the thresholds. One of the fundamental boundaries of a military organization is the chain of command. For a program office that is still an important boundary in the conduct of the day to day business. It is equally important to note that there has been a substantive attempt to redefine that boundary for the managers of DSARC programs. DODD 5000.1 specifically stipulates that a single individual be totally responsible for a program and that the number of organizational layers between the PM and the component Secretary be held to a minimum. The Air Force implementing regulation AFR 800-2 further defines a BLUE LINE, channel of communication from the PM to the Commander (implementing command), Chief of Staff, and the Secretary of the Air Force for specific programs.

All of these boundaries have been essentially imposed on the program office from the outside environment. There is another set of boundaries created by the program office. These can be of any variety ranging from, "Nobody talks to Headquarters but the Program Manager", to quality control specifications defining what is an acceptable product resulting from the business activities of the office. That is, boundaries also filter the output of the program office. A PM might designate only individuals of a certain rank or those in positions of authority to represent him or present briefings outside the program office. The created boundaries are of infinite variety depending on personnel and situations.

A program office is dependent on its boundaries, but it is also dependent on its environment. In fact, its raison d'etre is to provide a product to the environment; consequently, it is important to understand how and to what extent a program office relates to its environment across its boundaries.

A program office is clearly what is termed an open system; that is, it exchanges a great deal of information, material, and energy with its environment. A good way to view this exchange is in terms of the concept of boundary spanning sub-organizations and instruments.

There are many variants of boundary spanning elements within an organization, but the following examples will illustrate the idea. The information officer is the official spokesman for public releases that pertain to an organization. The Program Manager and his immediate staff usually interact with higher authorities on behalf of the program office. The Directorates all have ties to their functional specialists, sometimes only technically, but often both technically and organizationally. The administrative (or executive, or operations) office usually functions as the link between the program office and the supporting staff elements for supply, transportation, personnel, etc. The procurement Directorate and particularly the Procurement Contracting Officer is the bridge between the program office and the contractor. Resident Air Force Logistics, User and Training Command representatives are two-way boundary spanning elements between the program office and these vitally important commands.

In the conduct of the program office business there are several written instruments that span the boundaries that were mentioned. Two key instruments are the DCP and the contract(s) between the program office (representing the government) and the contractor. Other less important, but useful boundary spanning instruments are the Program Assessment Reviews, Selected Acquisition Reviews, briefings, contractor status reports, test reports, manning documents, supply requisitions, etc.

The importance of boundaries should be obvious from the above discussion. A delicate balance must be struck by the Program Manager to insure that his boundaries are permeable enough for the organization to receive the necessary inputs and deliver the necessary outputs; yet, maintain enough of a filtering function to establish an autonomous domain in which the program office can most effectively perform its functions. The many pressures and influences which are operative in the environment external to the program office must be selectively filtered to allow only the most important factors to affect the stability of the program.

Environment

Understanding the external environment, which makes up the rest of the universe of our systems model, and which is segregrated from the program office by the boundaries just described, is fundamental to understanding the forces that act in concert and shape program office activities. Kast and Rosenzweig describe the forces in the following fashion: "... environmental turbulence, cultural variables and the relevant task environment have an unquestioned but inadequately assessed impact on organizational performance." (18:131) It is useful to think of the environment as made up of two large segments: the societal (general) environment, and the specific (task) environment.

The societal environment is comprised of those elements and forces which affect all government organizations in our society. Many of the more important factors, such as literacy, stable political and legal systems, technological base, economic organizations, and fiscal system are taken for granted in America. It is equally important to recognize the interests and forces which operate in the general environment. These include: (a) political

interest in obtaining government contracts for specific areas of the country, (b) Congressional interest in defense programs because of the attempt to balance defense work with other national priorities, (c) inevitable funding cuts when the appropriations do not meet the requested budgets, (d) the inexorable inflationary trend, (e) equal employment opportunity requirements, (f) special contractual considerations given to depressed labor areas, and (g) the requirement to assess the environmental impact of any new weapon system. A special subset of the societal environment which the Department of Defense is particularly concerned with would include: (a) procurement regulations (the Armed Services Procurement Regulations), (b) standards of conduct and public trust issues, and (c) the personnel policies regarding military and civilian assignments, training, ratings, promotions, and job hiring or terminations. Finally, recently there has been an increasing distrust by the public of government in general and the military in particular arising from Watergate, Vietnam, and conflict of interest cases. All these issues, while not directly impacting on daily decisions of the program office must nevertheless be factored into the long term, policy deliberations which do affect the course of a program.

Most closely coupled to the program management decisions are those elements in the environment which need close attention and are called collectively "task environment." Although there is a hierarchy of these elements, the relative order will probably shift depending on the particular weapon system and the specific phase the program is in. However, for frontline weapons the prime task environment element is likely to be the threat. The increasing number, mobility, variety and capability of Warsaw Pact air defense weapons, for instance, must be an area of constant concern for fighter air-

craft programs. Other programs may find the volatility of the threat of little importance to their systems. Herein lie extremely congent criteria: the degree of influence that a particular task environment element will have on a program will be related to relevancy, to the likelihood of change, and to the rate of change of that element. The threat is a good example.

Key elements of the task environment for a major weapon system (as defined by DODD 5000.1) are the DSARC process and the individuals and staff which make up the principal offices of the Secretary of Defense (OSD). The Secretary and Deputy Secretary of Defense have become increasingly involved with management policies, program status, and key decision points of the major programs. The policies are enumerated in DODD 5000.1 and further augmented by DODI 5000.2 which describes the DSARC process, by DODD 5000.4 which defines the responsibilities of the Cost Analysis Improvement Group (CAIG), by DODD 5141.1 which defines the responsibilities of the Assistant Secretary of Defense for Program Analysis and Evaluation, and other directives covering the functions of Director of Defense Research and Engineering and his principal Deputy for Test and Evaluation, and the Assistant Secretary of Defense (Controller). The DSARC process requires OSD involvement in the key decision points of Validation, Full Scale Development, and Production via review by the DSARC principals (DDR&E, ASD(C), ASD(I&L), and ASD(PA&E)) and their advisors. In addition, the Deputy Director (DDR&E) for Test and Evaluation as well as the CAIG have major inputs into the decision deliberations at any DSARC. This is just the very top level of the OSD task environment that a program manager must understand and "make his peace with". Clearly there are other OSD supportive staff offices that are involved.

Each year after the President's budget has been submitted, as well as during other times, the program manager either personally or by correspondence, will usually have the opportunity to explain his program and its budget, to one or more Congressional Committees and their staff. This is a task environment of the highest order because it can directly affect the longevity of the program and the program manager.

The contractor is a key element within the task environment of a program office. Obviously, if the contractor is out of step in cost, schedule, or performance, the program office must quickly and decisively interact with its environment. The contractor(s) is so crucial to the entire process that it is possible to consider him as an interlocking system with the program office, but to be consistent with earlier definitions, he will be relegated to a special niche in the task environment. An earlier section addressed the boundary spanning elements and instruments used to interact with the contractor; however, it should be noted that normally the entire program office in some way or another relates to this element of the task environment. This discourse and engagement is the major reason for the program management office to exist.

Associated with the contractor physically but assisting the program management office is the government plant representative - either DOD or service specific. This office can become a key extension of the program director and his staff, by engaging the contractor on a full time, real time basis. Usually such key activities as the administration of the contract, the quality control program, the configuration control elements, and the acceptance test and product acceptance are accomplished by this office for the government. The actual signing of product acceptance documents (DD 250)

and disbursement (or withholding) of funds is accomplished by the plant representative. This office can be the strong right arm or the weak link in the program management chain.

The next collective group that exists in the task environment of the program management office is the Air Force hierarchy embodied in people, organization and policies. The Air Force regulations which say "how to" program manage a system include, but are not limited to AFR 800-2 and its AFSC Supplement, AFR 80-14, AFSCR 800-17, and AFSCR 800-18. There are many more regulations which prescribe day to day operations in a military organization. It should be noted that many of these regulations which are societal environment and task environment items such as personnel policies will specifically affect program office functions. These examples will be addressed later in the management and psychosocial subsystems.

The actual Air Force hierarchical organizations in the task environment are fairly obvious. Product Division (ASD), Headquarters AFSC, and the Air Staff. Several key elements or positions within those organizations deserve special attention. First, at Product Division level there are key staff elements such as: legal, procurement, financial (controller), and manpower which can greatly assist a PM in successfully acquiring resources and conducting his business. The System Staff Officer (SYSTO) at Headquarters, AFSC, and the Program Element Monitor (PEM) at Air Staff are the key coordinative points for the program office. The PEM has a particularly crucial role in coordinating the DCP and issuing the Program Management Directive (PMD) which outline the management objectives of the program. Two other very important staff elements are the Assistant Chief of Staff for Studies and Analysis (AF/SA) and the Assistant Secretary of the Air Force for Research and

Development. AF/SA plays a key role in determining force structure and conducting trade off analyses on system effectiveness and force cost effectiveness. AF/SA uses operations research and scientific management analyses to establish system quantities and characteristics which, in turn are used to compare alternative ways of meeting the stated need. This office can clearly spawn or kill programs. Likewise, the AF Secretary for R&D must be convinced that the proper attention is being paid to threat changes, technology improvements, and overall program risk before he becomes a program advocate. There are many other staff elements of the AF which play a role in the workings of a program, but the ones mentioned above are the most important.

At a different task environment level, that is horizontal rather than vertical in the organizational structure, are the real reasons for acquisition management. These are the user, the logistician, and the trainer. The user of AF developed systems will vary (and may not be AF: e.g., satellites for Army, Navy, NASA), but two prime examples are the Strategic Air Command (SAC) and the Tactical Air Command (TAC). The task environment influence wielded by the user is getting stronger and is being increasingly coupled with the developer early in the life cycle. This is done via representatives physically working in the program office; (a) voting as members of the configuration control board; (b) participating in Request for Proposal preparation and source selection; (c) conducting operational testing all the way from the validation phase through the production phase; (d) participating in Preliminary and Critical Design reviews, Functional and Physical Configuration Audits; and (e) participating in the entire gamut of program activities including preparation for DSARC.

The test agency for most new aircraft is the Air Force Flight Test Center (AFFTC), and other systems have their comparable test groups. The test program cannot be planned, scheduled, and budgeted without their help. This is accomplished formally via the Program Introduction Document which is a statement of work from the program office to the test center. It is answered by a Statement of Capabilities which, when approved and funded by the program office, becomes the test contract for the specified tasks and duration. Additionally, via DODD 5000.3, "Test and Evaluation", each service now has an independent test agency to report on major test activities, and recommend and assure that operational test and evaluation is properly planned and accomplished. In the Air Force, this organization is Air Force Test and Evaluation Center (AFTEC). During the full scale development and early production phases of an aircraft, it actually manages and in some cases flies some of the test sorties. Their independent report also surfaces in the DSARC process.

Closer to home (physically) and very important to the program manager is the task environment that is made up of the Technical functional organizations. This, in the case of ASD, is primarily the engineering Deputate which has the specialists who are colocated in the program office as well as those who remain in their respective organizations. As defined here, the colocated people are within the system and the rest of the functional elements are part of the task environment. The timely manning of key positions such Chief Engineer, Integration Engineers, et al. is a prime point of discussion between the PM and the functional Deputies. Included here, are any coequal organizations providing elements of Government Furnished Equipment or overseeing key development items like avionics and countermeasures. Where it

is not routine for organizations to supply their products for use on other large systems, the management task of the PM is clear and Memoranda of Agreement may be useful. A special group that exists in the task environment of a major aircraft system is the Senior Engine Review Group. This is an ad hoc body of technical experts who advise the PM and Product Division Commander on the technical qualification status of new or modified engines. This group has no formal power, but can be extremely influential regarding technical risk assessment of an engine program. If they interpret the Military Qualification Test results on an engine to be incomplete, or worse yet, unsatisfactory, budgets and schedule are placed in serious jeopardy.

The final elements of the task environment that will be discussed are those associated with the contractor. They can directly affect the price of the contract and are therefore important. Key elements are the shrinking technology base in industry and the labor unions which represent the "metal benders" of industry. Heavy industrial capability and capacity appear to be centralized in a few large companies. The number of corporations building military aircraft is declining. Major aircraft engine developers are few in number. Landing gears are made by only a few companies. Large forgings and castings are very difficult to obtain and hence very long lead times are required. This shrinking of the technological base is due to a general decline of heavy industry orders, and the environmental control constraints placed on existing old manufacturing facilities. Finally, the labor union negotiated wage increases are added directly to the billings and bid prices on government contracts.

The task environment elements that were discussed are not exhaustive, but, for the purposes of the model, give the reader an idea of the demands placed upon the PM. However, this is only a part of his job. Now the model will consider the elements within the system boundaries. This will be done by describing the: (1) goals and values, (2) technology, (3) structural, (4) psychosocial, and (5) managerial subsystems of the program office.

Goals and Values Subsystems

Before beginning this section, it should be explained that each of the subsystems is not distinct in and of itself. Rather, they blend together and are interactive. The technical subsystem influences all others as does the goals and values, psychosocial and certainly the managerial subsystems. The one subsystem with the most separability is the structural subsystem, but even it shapes and is shaped by others.

The understanding of how goals and values affects the program office functioning must proceed from an examination of values as well as an examination of how the goals of the organization are shaped. There is no magic or final solution to be offered, only ideas which might stimulate the reader's thinking so he may be able to tailor the values and goals subsystem to his own situation or organization. "Values are normative views held by individual human beings (consciously or subconsciously) of what is good and desirable. They provide standards by which people are influenced in their choice of actions. Social values reflect a system of shared beliefs which serve as norms for human conduct." (18:154-5) There are several different kinds of values: (1) individual, (2) group, (3) organizational, (4) those held by constituents of the task environment, and (5) cultural. To some extent, these normative ideals will shape the goals at various operating levels of the

organization. An individual has a vast complex of values acquired while maturing. These might be religious, right from wrong, human worth, right to work, freedom of action, speech, and other moral precepts. They shape the individual's character and constrain his behavior patterns. The way an individual feels about: others, freedom, war, killing, the value of working for a living, and his job and family will determine his goals to a large extent. Some people value freedom above self. Others abhor any kind of violence. Still others put their family first. Group values are also important since peer pressure is very powerful. This might be group honesty, technical excellence, responsiveness, or some negative values such as lowered performance levels, social rejection of particular individuals or behavior. Organizational values are more general in nature, like: timely work, good product performance, cost effective designs, and taking care of people. Values held by constituents of the task environment are influential in prescribing organizational behavior such as: promoting small business, fair profit for work performed, freedom from conflict of interest, and even open fair competition for government contracts. Cultural values are ones held by society in general, such as freedom with all the rights given in the Constitution. These all influence the goals that are held as things to achieve.

Goals are most easily understood as desired future conditions. Thus, our country's goal to remain a free society requires that we maintain a strong military force. How strong is a difficult question and is not within the scope of this paper. Congress wants to assure freedom while providing jobs for their constituents which they hope will result in re-election. Contractors want to maximize profits. The Air Force wants a bigger share

of the defense mission. Everyone wants the program office to build the best system possible, but not exceed the budget or the schedule thresholds. Organizations want to create an image of successful operation and credibility. Individuals may want to get promoted, or others may want to be inconspicuous and just earn a comfortable living for their families. If there is a reasonable correlation among the goals of all of the elements listed, then progress is facilitated. When the goals are not well aligned, a management challenge is offered. More on this point will be discussed in the psychosocial and managerial subsystems. With this brief baseline we shall move to the second of the five subsystems in our model - the technology subsystem.

Technology Subsystem

The technology subsystem in most program offices is very highly developed and complex. "Technology refers to knowledge about the performance of certain tasks or activities." (18:181) The real crux of the issue is that the more dynamic and technically sophisticated the tasks the higher the technology demanded of the participants. Consequently in a typical program office, the professionals (approximately 80% of the people) will have at least one college degree and often an advanced degree. In addition to being well educated, most of the professionals will have a reasonable amount of experience. In comparison to the military personnel, the civilian professionals will have more experience and will also tend to be the detailed specialists. Engineering will have experts in materials, structures, avionics, flight controls, propulsion, reliability, aerodynamics, and computer technology. The list is endless and is a function of the job at hand. The array of talent ranges from Ph.D.'s in plasma dynamics to mail clerks. This spectrum of skills and experience shapes the organizational structure, affects the psychosocial

subsystem, and clearly presents a management challenge in terms of motivation and the development of a cohesive group that works toward the same organizational objectives.

Structural Subsystem

The structural subsystem is an important element of the systems model of a program office because it forms a framework within which the process of systems management occurs. Structure can be defined as "... the established pattern of relationships among the components or parts of the organization." (18:207) The most obvious parts of the structure of a program office have been described in Section II. The command lines, span of authority, span of control, and line and staff arrangements depicted on organization charts are the traditional management structure ideas that are ingrained into bureaucratic organizations like the Air Force. The concepts are well understood by most and provide a modicum of security in that theoretically everyone knows whom he works for and who works for him. Additionally, the functionalization of the subelements identify at least in a general way the responsibilities of the people in the subgroup - e.g., test, procurement, engineering. That division of specialization is very apparent in the large Air Force program office. However, even with what is termed an aggregate organization, at the Aeronautical Systems Division, the Engineering Deputate formally retains control of the engineering specialists assigned to the program office. Lawrence and Lorsch describe a system as, "An organization of interrelated behaviors of people who are performing a task that has been differentiated into several distinct subsystems, each subsystem performing a portion of the tasks, and the efforts of each being integrated to achieve effective performance of the system." (19:3) The same researchers found that "groups working

on relatively simple and certain tasks tend to perform the task better when the group had more structure; (i.e., preplanned and limited communication nets); whereas groups working on uncertain, more complex tasks tended to perform better with less structured communication nets." (19:7) It is clear from the above passages that there is more to the structure of a program office than can be gleaned from the organization chart. Certainly with key organizations not even included in the charts (engineering) and the complexity and dynamic nature of the job of major weapon acquisition there is more to "structure" than organizational subdivisions.

Not visible in terms of documentation anywhere outside a program office is a subcomplex of formal and informal working structures that in fact make a program a success or a failure. The one key characteristic of these working elements is that they are primarily based on special expertise rather than position power. Ultimately their actions merge back into the formal structure either at a key Director level or the Program Manager level. Principle formal substructures include: (1) Configuration Control Board, (2) Source Selection Committees, (3) System Safety Group, (4) Design Review Teams, (5) Production Readiness Review Teams, and (6) numerous ad hoc panels formally tasked to accomplish some function. The informal structure which typically involves horizontal subelements is much more difficult to identify because it is so dynamic regarding membership and function. Kast and Rosenzweig contend," Establishing effective means for dealing with the problems of horizontal integration in complex organizations is perhaps the single most important structural problem." (18:230) Key to the horizontal integration substructure of many large Air Force program offices is the Projects Directorate. This group functions as a subsystem mini-program office within the

overall system office. An apt idea is the Likert "linking pin" concept where Projects is a member of both the formal and informal structure charged with horizontal and vertical task integration. The efforts are all service (training, deployment) or product (weapons, avionics) oriented and culminate in the total system. Other functional Directorates such as Program Control, for budget planning, and test, for system testing, also operate in a similar mini-program office way; calling on and directing whomever is needed to accomplish the task at hand. This then is the real structure of a program office and it differs from one program to the next. The individuals, weak and strong, shape the working organization and the only way to know it is to live in it. For example, some excellent engineering ideas come not from engineering but from operators, test, projects or wherever; and some of the best budgeting information comes from engineering. Working ideas and the synergism that results from diverse groups ignoring formal organizations is the life-blood of a program provided these results can be blended back into the formal authority chain for decision and implementation. We will now attempt to examine the most complex subsystem of all - the psychosocial.

Psychosocial Subsystem

As indicated, the psychosocial subsystem is by far the most complex of the subsystems covered. The basic ingredient is people. The entire question of who they are, what they want, what motivates or demotivates them, and how best to constructively combine the talents available into a productive work unit is the crux of this subsystem's importance. Without the people the organization cannot function.

It is important to understand the people working in the program office because they all have different aspirations and will respond differently to

different management approaches and different situations. The administrative personnel probably need a more structured and controlled job situation than do the technical professionals. That does not mean, however, that either group has any less sensitivity to belongingness or self-actualization needs - just that they are different kinds of the same needs. The key is an open communication channel among the workers and between workers and supervisors. An interesting research finding showed that supervisors felt their workers' prime consideration was good wages; whereas, the workers rated wages as fifth in importance out of ten factors. "Full appreciation for work done" was of prime importance to the workers while their supervisors felt it was the eighth in importance to the workers. (17:39) This finding illustrates the degree of misperception that can exist. Most workers in the program office will have their physiological and safety needs (job security) well satisfied. Social needs might be important to some, but esteem and self-actualization will probably be the prime needs. The management of the program office must find ways to allow the individual needs and goals to be satisfied lest the workers experience frustration with attendent reactions like aggression; regression or resignation, all of which can dramatically reduce performance. The key to encouraging job satisfaction and good performance would appear to be an emphasis on the factors that Hertzberg calls "motivators"; that is achievement, recognition for accomplishment, challenging work, increased responsibility, and growth and development. (17:55) Clearly, this is much easier said than done; however, it is well worth the effort.

A very important factor within the psychosocial subsystem is the group dynamics which occur within the program office. Group status can be a very powerful positive or negative factor. It provides a system wherein the

workers relate to each other and helps define acceptable, predictable behavior patterns. The individuals belonging and esteem needs can be positively affected by group status. The group can be the means of program task accomplishment provided the individual, group, and organization goals are fairly well aligned. The management of an organization should create an attractive climate so people want to come to work in the organization and feel they can achieve their personal goals via accomplishing the organizational goals. However, if people come to expect certain treatment such as recognition and it does not materialize, the result is negative reinforcement, somewhat akin to frustration. Promotion opportunities are a good example. They are touted in a program office, however, because the program manager really does not control them, if they do not materialize the result is worse than if the expectancy had not been created.

Any large program office attracts a wide cross section of talent, but one group deserves special note or caution - that is the "superstars". These are the few individuals (hopefully the Program Director is among them) who are constantly looking for the toughest tasks and the broadest possible responsibility and authority. They have the highest self-actualization needs and demand recognition and reward for their achievements. The reason they are so important is that they tend to be leaders within the program office and are like leverage in the finance world. As positive contributors they increase the probability of program success, but, if dissatisfied they can destroy the working relationships within a program office. The program manager cannot do without them, but he cannot have too many because there are a limited number of "leader" jobs in a program office. If they are

given jobs which lack responsibility and authority, their reactions will tend to result in activities which are detrimental to a program.

Equally important as the composite cast of the program office is the make-up of the Program Director. He must recognize his own values, motivations, goals and achievement needs. Because he had so much positional power and authority, each action he takes regarding his people is magnified. His actions will be derived from his personality and experience base, and will greatly influence how the workers perceive themselves fitting into the organization and the probability of satisfying their own needs. This spectrum of sensitivities must be orchestrated along with the other subsystems of goals and values, structural, and technical to achieve the organizational objectives - the vehicle is the managerial subsystem.

Managerial Subsystem

The managerial subsystem is most often analyzed and described via the information gathering - decision making process. While that perspective is valid even in the model being constructed here, a little more emphasis will be placed on the "people" aspects of the managerial subsystem at the expense of the mechanistic "reports and data flow" slant of most authors. Management in the organizational setting is the coordination of group effort toward accomplishment of the organizational goals. Essentially, management is the process of integrating human and material resources into a total system for objective accomplishment. Kast and Rosenzweig summarize it as:

> The managerial system is the means of linking the primary subsystems of organizations. The environmental suprasystem provides the setting within which organizations function. The technology is important and is often directly related to organizational structure, both formal and informal. The psychosocial system provides an internal atmosphere for day-to-day operations. The managerial system's primary role is that of integrating activities toward the achievement of explicit or implicit goals. (18:357)

Kast and Rosenzweig also provide an interesting view of the management subsystem as made up of a strategic level, operating level, and coordinative level. The top management in the program operates at the strategic level; setting policy, program objectives, and relating to the external environment. The operating level are the actual workers who carry out the real tasks of the program office. Between those two extremes is the coordinative level which in a program office is often made up of Directors or Division Chiefs. However, again, that special Directorate, Projects, is increasingly given the coordinative function in the program office.

Planning and control mechanisms that operate in the program office are key aspects of the managerial subsystem. The formal documentation, such as the Decision Coordinating Paper, the Program Management Directive, the funding documents, the contracts, and the Program Management Plan prescribes the approach to be followed and serves as the measurement device for controlling actions. With, (a) a Design to Cost goal, (b) a Life Cycle Cost target, (c) an Initial Operational Capability date, (d) DCP thresholds on cost, schedule, and performance, and (e) the entire reporting system of the DSARC process, Selected Acquisition Reports and Program Assessment Reviews, there is no lack of control in the military systems acquisition business. Within these constraints, of course, the program manager still has some decision making room. The decisions are not easy. One author suggests:

> Every executive wants to make good decisions. He is uneasy about decisions based on data he does not fully understand, gathered by people he does not fully understand, and presented in terms he does not fully understand. He is often left to shudder at the specter of catastrophe beyond his control. (20:53)

The situation can be better than depicted above if the management of the program office takes the time to instill confidence in the organization

and have good communication about organizational objectives, plans, and feedback on accomplishments. An excellent way to do this is to involve all key members of the management staff in planning the total spectrum of program activities together. This should be from the present program point all the way to disposal of the system. Obviously the short term activities are done in greater detail than long term ones. As the activities are planned, an overall program network (such as Critical Path Milestone, Pert, or the like) evolves with all the key people taking part, and knowing what has to be done when and who is responsible for what. This can then be periodically used as the review criteria to measure progress. Again that should be done in an open session to keep everyone informed. The key planners are not only the key doers but they can promulgate the plan throughout the suborganizations they manage. Care must be exercised so these plans meet the overall program objectives. The resultant commitment and sense of involvement achieved can easily outweigh the time needed to achieve this group planning. There will be times when internal conflicts arise within the managerial system. When properly handled these conflicts can lead to new ideas and unique problem solutions. Conflicts can also create the opportunity for the conflicting individuals and groups to gain a better understanding of the reasons behind issues on which there is disagreement. Clearly, some of the structural elements mentioned earlier such as the Configuration Control Board are important decision making bodies. The planning process will make this body even more effective as it considers configuration changes and decides where they fit in the overall program plans. These comments on managerial system techniques are all pertinent, but we must return to the people side of the problem for implementation.

Recently, the trend in management has been to move away from the authoritarian, military model and toward the participative, people oriented behavioralist model. It is fundamental to systems acquisition management to recognize the fact that it is not a combat situation, and, hence, a different style of management is needed. This is one of the most traumatic facts that most military men must face when they become program managers. Decisions are questioned continually, unendingly, and by everyone. The decisions made must survive the test of time as new data becomes available, and sometimes the decisions must be altered or even (heaven forbid) reversed. The type of management style used in the program office should be in consonnance with the three sometimes conflicting forces: (1) those within the manager himself, (2) those within his subordinates, and (3) those in the situation. (22:7) A work climate must be established wherein people have the chance to satisfy esteem and self actualization needs. This might require some detailed matching of people and jobs. An applicable idea is that job performance is a function not only of the individual's ability and motivation, but also the opportunity provided for him to grow and attain self-actualization. One of the key problems in achieving this type of approach is the need to work within the military and civilian personnel systems. Motivation is difficult to achieve when promotions are controlled outside the program office. Recruiting and placement are difficult with stereotyped specialties which may prevent a good match between the job and available personnel.

Recently, a number of models of leadership style have evolved. They include: the Blake and Mouton Grid Theory, Likerts' four systems, and the Tri-Dimensional leadership model. In the Grid model, the contrast is made among overly high concern for people (1,9), overly high concern for produc-

tion (9,1), and the middle ground (5,5). The thesis being the ideal is 9,9, "Where work accomplishment is from committed people; and interdependence through a "common stake" in organization purpose leads to relationships of trust and respect." (17:76) This is quite similar to Likert's System 4 management style where, there is extensive, friendly superior-subordinate interaction with a high degree of confidence and trust. A further development of leadership styles essentially added another dimension to earlier conceptual dimensions. This other dimension is effectiveness which recognizes that in some management situations an authoritarian style is exactly what is needed rather than a high concern for people relationships. Conversely, some extremely well motivated groups would perform very well for a low task or high concern for people style, and rebel against an authoritarian style. By now the issue should be obvious, there is no one "best" style, rather the leader, the people, and the situation must all be considered in arriving at the most appropriate style.

One of the key ingredients to a successful program is aggressive, bright, motivated people. The kinds of things that management might do to motivate people usually involve positive feedback. This might be recognition for good work through awards and efficiency ratings. It might be worthwhile to consider other strategies such as attendance at special symposia, or nomination to management schools like Harvard Business School or Defense Systems Management School. It would be interesting, if the proper resources were available, to put an individual in charge of the psychosocial aspects of the organization. Too many times the impact on people of a management directive is a secondary thought. A successful leader (or leaders) is able to not only get the tough program job done, but also to create an environment where people can be happy

and satisfied doing their jobs. A leader and the people he leads (manages) can both change with time such that the total organization can evolve from a Blake & Mouton 1,9 or 9,1 toward a 9,9 or a Likert System 1 to a System 4. In some instances those styles will not work, but over the duration of the acquisition phases of a program the management evolution should be possible.

This concludes the systems model of an Air Force Program Office, and as stated earlier the model is adaptive to changes in the environment. A few important changes will be sampled in the next section - the environment - a moderator variable.

The Environment - A Moderator Variable

It is always very difficult to observe change when it is evolving right around you. It is much easier to see change in historical perspective; however, some recent examples can be cited.

Deputy Secretary of Defense Clements in remarks made at DSMS in September 1975 had some observations that can affect program management: (1) costs are continuing to rise with an attendent dissatisfaction in Congress for overruns, schedule delays, and failures, (2) there is still too much personnel turbulence among key PM's, (3) industrial base is eroding, (4) foreign military sales level is rapidly rising without DOD having a consistent pricing policy, and (5) integrity is under fire. (11:4) Secretary Clements has also instituted a once a month letter from the program managers directly to him bypassing the Command channels.

A key general officer in Assistant Secretary of Defense (Installations and Logistics) said he felt there are three major changes under consideration in program management: (1) a power struggle, at the OSD level, over the pro-

posed changes in DDR&E, ASD (I&L), ASD (C) and ASD (PA&E) with various combinations being studied, (2) an increasing emphasis on business management in the program management office even to the point of having the PM a financial specialist rather than an operational or technical type as it currently is, and (3) the new Office of Federal Procurement Policy would soon be flexing the muscles in its policy charter and impact the procurement strategy of major weapon systems. (9:18)

The above ideas were discussed at the Air Staff level with Program Element Monitors and Staff analysists. They were aware of the existence of the issues, but did not think any would affect the day to day business. One issue that did surface is the lowering of the DSARC profile. For example, the recent full rate production decision of the A-10 Close Air Support Aircraft, DSARC III B, was accomplished, (a) with little fan fare, (b) without the DSARC convening, and (c) by coordinating the Decision Coordinating Paper.

Changes within AFSC that will affect the PM were announced by General Evans, Commander. The production and procurement personnel formerly assigned to each program office will be placed in a functional organization. (4:3) This complicates the coordination job of the program office and could make timely responsiveness an issue.

A far reaching change has taken place in the Air Force military personnel system. This is the advent of the controlled quota on officer effectiveness reports (OER). Under this system, a specified review level must not have more than 22% of its officers (of equal grade and the same cycle) rated in the highest block. This means, the competition for promotions will be centered on the local OER. A PM who usually has a high quality staff will have to "fit" his ratings to a predetermined distribution curve. This hurts an office

which has a high percentage of outstanding people as some members will have to be placed in the lower rating blocks. The result might be difficulty in getting quality people to enter the program offices where the competition for good OER's is intense. It is easier to get a good OER in a mediocre office. The Air Staff is already experiencing this, with their selective assignment criteria coupled with the forced distribution system, resulting in officer dissatisfaction. There are other trends around, but the forest is hard to see for the trees.

SECTION V

SUMMARY AND CONCLUSIONS

The Kast and Rosenzweig open systems model offers a powerful and realistic vehicle for understanding and managing the complex and dynamic aspects of the large Air Force program office. The concept of permeable boundaries is a cornerstone of the model; since it determines the extent to which the program office is in constant interaction with its environment while still maintaining its own identity in terms of autonomy and stability. The program office can be broken into five subsystems: goals and values, technical, structural, psychosocial, and managerial. The most important element within all the subsystems is people. Proper understanding, motivation, and leadership of the program office are real challenges to the Program Manager. The application of the Kast and Rosenzweig model as described in this paper may soon be outdated since the Air Force seems to be moving back toward matrix organizations where key program participants remain in the functional offices. The heyday of the big program offices in the Air Force may be over with the advent of cutbacks in manpower, and the tough competition between equally outstanding professionals for the limited top efficiency ratings.

The PM's job is probably one of the most challenging the Air Force has to offer in peacetime, but the mental and physical demands are tremendous. Yet, that is where the action is:

> Far better it is to dare mighty things, to win glorious triumphs, win though marked by failure, than to take rank with those poor spirits who neither enjoy much nor suffer much, because they live in the gray twilight that knows not victory nor defeat. (21:847)

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