SAN FERNANDO VALLEY STATE COLLEGE

ASPECTS OF

INDUSTRIAL PROGRAM MANAGEMENT

A THESIS SUBMITTED IN PARTIAL SATISFACTION OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

by

SANFORD STERN

June, 1968
THE THESIS OF SANFORD STERN IS APPROVED:

COMMITTEE CHAIRMAN

SAN FERNANDO VALLEY STATE COLLEGE

JUNE, 1968
DEDICATION

When I had doubts, she bolstered me.
When I grew tired, she comforted me.
Through it all, she was loving,
patient, and understanding.
It is to my irreplaceable Darling,
my wife Charlotte, that I dedicate
this effort.

SANFORD STERN
TABLE OF CONTENTS

DEDICATION ........................................ iii
LIST OF FIGURES ................................... x
ABSTRACT ........................................... xi
Chapter

I. INTRODUCTION ................................. 1
   Statement of the Problem
   Importance of the Study
   Limitations of the Study
   Source of Data
   Organization of the Study
   and Report

II. THE ROLE OF INDUSTRY IN SYSTEMS
    DEFINITION AND ACQUISITION ................ 16
    Evolution of a Typical
    Weapon System
    Typical System Acquisition
    Flow
    Present Day Role of Industry
    Model Contractor's Organization
III. THE CONCEPT OF PROGRAM MANAGEMENT

The Need for Program Management
Reasons for Program Management
Definitions of Program Management
Clarification of Program and Project Relationship
Development and Changes in Definitions

IV. THE WORK BREAKDOWN STRUCTURE

The Necessity for a Unifying Structure
The Integrated Framework
Types of Work Breakdown Structures
Summary Work Breakdown Structure
Project Summary Work Breakdown Structure
Contract Work Breakdown Structure
Project Work Breakdown Structure
V. PURPOSE OF THE PROGRAM OFFICE

The System Program Office

Initiation of System/Project Management

Industrial Counterpart of the System Program Office

Purposes of Industrial Program Office

Basic Considerations Applied to Company Business Activities

Determination of Program Management Responsibility Programming

VI. CHARACTERISTICS OF PROGRAM MANAGEMENT

Organization and Objectives

Accomplishment of Specified Program or Purpose

Individual Entity to Accomplish Designated Purposes

Management Planning Systems and Information Flow
The "Musts" of Successful Program Management
Program Assets/Liabilities

VII. ORGANIZATION AND ADMINISTRATION
OF PROGRAM MANAGEMENT . . . . . . . . . . . . . . . . . . . . 96
Planning and Organization
Types of Organization
Organization Rights and Responsibilities
Program Management/Top Management Interface

VIII. STAFFING PROGRAM MANAGEMENT . . . . . . . 107
The Program Manager
The Responsible Activity
The Program Administrator

IX. SOME PROGRAM MANAGEMENT PROBLEM AREAS . . . . . . . . . . . . . . . . . . . . . . . . . . . 127
Capable Program Managers
Capable Program Administrators
Capable Responsible Activities
Communication
Management Support Versus Interference
Management Information System

X. IMPROVEMENTS IN PROGRAM
MANAGEMENT ........................................ 139

Determination of Principles
Dynamic or Static
Methodology
New Thinking and Doing

XI. SOME PRINCIPLES OF INDUSTRIAL
PROGRAM MANAGEMENT ............................ 148

The System/Program Concept
Legal/Contractual Aspects
Program Management
Organization
The Program Office
The Program Manager
Rules of Conduct
Industrial Program
Management
XII. SUMMARY AND CONCLUSIONS .......... 161
Summary
Conclusions

BIBLIOGRAPHY .............................. 165
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The Weapon System Concept and Its Relationship to the Program</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Package Concept</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Typical System Acquisition Flow.</td>
<td>23</td>
</tr>
<tr>
<td>3.</td>
<td>Summary Work Breakdown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structure--Missile System</td>
<td>51</td>
</tr>
<tr>
<td>4.</td>
<td>Partial List of Definitions for</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summary Work Breakdown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structure--Missile System</td>
<td>54</td>
</tr>
</tbody>
</table>
ABSTRACT

ASPECTS OF
INDUSTRIAL PROGRAM MANAGEMENT

BY
SANFORD STERN

MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

JUNE, 1968

The whole concept of joint participation by industry and government in both the development and management aspects of systems and programs is still relatively new and is not as yet completely defined. The government, for its part, has developed a procedural system and has published various directives to cover its functions under its new weapons system concept. These directives establish that certain data, functions, and activities are required by the various government personnel and agencies. Accordingly, the counterpart industrial systems and procedures must be so planned and so followed that the industrial outputs provide the inputs required by the government system organizations.

The problem in industry is that it must first understand what the government's required inputs are and how the government's systems operate. With this
understanding, individual industry members can plan and operate so as to produce the required outputs. The situation is somewhat complicated by the fact that the industrial outputs are required to be provided in accordance with certain of the government's criteria and specifications.

The problem for industry essentially becomes a need to better understand and to improve the business management aspects of its own industrial program management. This points out the need for publications or bodies of informative and recognized literature that can guide the related internal approaches to be followed by industry personnel. In this new, developing field, there are as yet few, if any, generally recognized and acknowledged experts.

Studies of this type are important to that segment of industry which presently does, or will do, business with the various government agencies which require program management as a standard industrial operating procedure. In such instances, this requirement becomes a contractual obligation involving compliance and fulfillment. It is imperative that contractors be fully aware of the obligations and requirements to which they are agreeing. From a review of the criteria used to determine the applicability of program management, it is
probable that more, rather than less, applications will be required in the future.

Program or system management is basically a management tool that should be able to stand on its merits alone to give it acceptance and use. However, its incorporation into contractual provisions makes it an obligation rather than a choice.

This study into the philosophy, policies, principles, or guides that are involved in industrial program management indicates that there are certain generalizations that can be proposed as principles of industrial program management. These principles can be used to better understand and to improve the business management aspects of industrial program management.
CHAPTER I

INTRODUCTION

The Problem

Statement of the problem

Weapons and space systems development today are largely the responsibilities of the aerospace and the missile manufacturing industries. To accomplish their tasks, "industry members must cope with the most complex manufacturing and production control problem to be found in any industry."¹

The business of developing and manufacturing weapons is presently larger than any single industry. Current United States defense budgets in excess of seventy-three billion dollars are being requested for the 1968 fiscal year alone.² Although only a portion is intended for equipment acquisitions, the cost involved is still in the multi-billions. For comparison, the


international oil business, the world's largest single industry, pumps only ten billion dollars worth of petroleum each year. For the past ten years, total national security and space expenditures have averaged approximately ten percent of the gross national product.\(^2\)

The defense and aerospace industries perform work that is quite different from that of most commercial enterprises. Engineering from 10 to 100 times more precise than the best needed commercially is demanded by the tasks at hand. It is not unusual for defense and aerospace industries to work on projects that often push beyond the present frontiers of knowledge.

The government has endeavored to minimize its own control and monitoring efforts in these areas by establishing what is known as the "weapon system concept." This approach has one contractor, commonly called the "prime contractor," assigned the role of weapon system manager and made responsible for the proper overall development of that particular weapon system.


The weapon system concept has been adopted by the services and other government agencies to enhance the system development process. Higher performance requirements and the increasing complexity of military and space equipment has increased the need for system integration. The older approach whereby a government agency procured independently developed items of equipment and then integrated them into a workable system has been found to be inadequate for present day needs.

Another development, the "Program Package Concept," has enabled the Department of Defense to "mission-orient" this nation's defense requirements into a package consisting of nine basic programs. These basic programs contain various "program elements" which are dollar-costed and time-phased functionally. Program elements usually are individual systems.

Specific examples can be used to illustrate the Program Package Concept. The "Strategic Retaliatory Forces" is one of the nine basic programs. "Aircraft Forces," "Missile Forces," and "Command Control" are classification groupings within the basic Strategic Retaliatory Forces Program. The "Atlas Program Element," the "Titan Program Element," and the "Polaris Program Element" are specific program elements within the general grouping of "Missile Forces." Therefore, each of these program elements is an individual system. As such, each
individual weapon system has its own System Program Office (SPO) and System Program Director. To the System Program Director and his System Program Office is assigned the management of all the effort necessary to produce that system—the composite of equipment, skills, and techniques capable of performing or supporting the assigned role.  

FIGURE 1

THE WEAPON SYSTEM CONCEPT AND ITS RELATION TO THE PROGRAM PACKAGE CONCEPT

PROGRAM:

For defense requirements, one of nine "mission-oriented" basic Programs.

Example:

Basic Program: Strategic Retaliatory Forces Program.

Consisting of: Missile Forces.
Aircraft Forces.
Command Control.

PROGRAM ELEMENT:

Each Program contains various Program Elements.

Example:

Program: Strategic Retaliatory Forces -- Missile.

---

FIGURE 1--Continued

Titan Program Element.
Polaris Program Element.

SYSTEM:

Normally each Program Element is a System.

Example:

Titan Weapon System.
Polaris Weapon System.

WEAPON SYSTEM MANAGER CONCEPT:

"Prime Contractor" assigned role of Weapon System Manager.

Example:

Titan Program.
Polaris Program.

A Weapon System embodies the conception, definition, acquisition, and operation of weaponry hardware to meet the specific operational requirements of the military objectives that are determined by the Office of the Secretary of Defense and the Joint Chiefs of Staff to fulfill the national objectives of the United States Government.
The AFSCM 375-3 describes the System Program Director as

the officer responsible for managing all activities concerned with planning and executing the system program. He is the commander of the military organization and a manager of managers for all other activities. His functional responsibilities are those common to top level executives everywhere, i.e., planning, organizing, coordinating, controlling, and directing. In the final analysis, the system program director is responsible for the total system program while holding subordinates responsible for specific tasks or objectives. He cannot delegate overall responsibility. He stands in a position to receive credit for successful accomplishments or to accept responsibility for failure.6

The System Program Director is, therefore, the highest management official, or manager, representing the government, or the customer, for a particular weapon system or program element. Under the weapon system concept, the prime contractor likewise assigns a high management official, or manager, to represent the contractor for this particular system or program.

The whole concept of joint participation by industry and government in both development and management aspects of systems and programs is still relatively new and not as yet completely defined. In the "Foreward" to the System Program Office Manual, General B. A. Schriever states:

6Ibid., p. 11
Recently I directed a series of manuals be published in the 375-series to cover the integrated activity involved in system management. The System Program Office Manual is an introduction to the series and covers the philosophy and policies involved in this approach. It is written intentionally in an easy reading style to be a comprehensive guide for any individual involved in a system program management or support function. Regardless of job or organizational assignment, I consider it essential that every person performing system program functions, read, understand, and comply with the philosophy described in this manual.

It should be kept in mind that the AFSCM 375-series of manuals have been written from the point of view of, and directed to, those concerned government or customer personnel rather than to their industrial counterparts. Industrial personnel reading the AFSCM series of manuals learn what data, functions, and activities are required for the various government personnel and agencies. Accordingly, the industrial systems and procedures must be so planned and so followed that the industrial outputs will provide the inputs required by the governmental system organizations. Possibly what is needed is a publication or a body of informative and recognized literature that can guide the related internal industrial approaches to be followed by industry personnel.

\footnote{Ibid. (Italics mine.)}
Keith Davis, Professor of Management at Arizona State University, states in his report on a research project concerning industrial program managers that:

The role of program manager, sometimes called project manager, in technical work is a relatively new development in management. . . . Program management is an outgrowth of government needs to develop complex military projects and make them operational in the shortest possible time. It developed naturally from a need without much theoretical formulation. . . . Even today there is only a small amount of literature on management aspects of program management. Now that we have program management and know it works, we are trying to understand and improve it.8

This essentially is the problem: the need to understand and to improve the business management aspects of industrial program management.

Importance of the study

This study should be undertaken because of its importance to that segment of industry which presently does, or will do, business with the various government agencies which require program management as a standard

---

operating procedure. In these instances, the requirement for program management becomes a contractual obligation requiring compliance and fulfillment. It is imperative that the contractor be fully aware of the obligations and requirements to which he is agreeing. From a review of the criteria used to determine the applicability of program management, it is probable that more, rather than less, applications will be required in the future. Examples of some criteria are:

Mandatory applications of program management:

1. High priority programs.
2. High dollar values involved.

Optional* applications of program management:

1. Significant effort on military posture.
2. Closely related systems--high total dollars.
4. Organizational complexity or new technology.

*The option is the contracting agency's in accordance with the guiding policies, not the option of the industrial contractor.
5. Extensive coordination or support.

6. Urgency; unusual difficulties.  

Professor Davis has said, "Even today there is only a small amount of literature on management aspects of program management." It is being applied and taught mainly in industry, as industry learns about it through its application. Whether or not companies regard internal operating procedures as proprietary matters, there generally is no great pressure or urge on the part of companies to show or to teach outsiders, even in different industries. From where, then, does informative and practical data and literature on this subject come?

The manner in which program management operates is dependent upon the specific situation and how it is applied in that situation. It is possible to establish it in different ways to fit organizational variations and

---


10 Role Perceptions of Program Managers, p. 2.
This is true within a given company or between different companies, even companies within the same industry. Consequently, some criteria or circumstances for judging which type of application to use is necessary.

Program or system management is basically a management tool to increase "overall management professionalism to reflect a position of leadership through demonstrated performance." As such, it should be able to stand on its merits alone to give it acceptance and use. However, its sanction by government agency regulations and its incorporation into contractual provisions makes it an obligation rather than a choice.

When program management becomes a requirement for a company, a system of industrial program management must be provided. It is obvious that program management can result only from the planning and organization for it. Its effectiveness can come only from the manner in which it is implemented and enforced.


12 AFSCM 375-3, "Foreward."
The field of program management is comparatively new. General Schriever states that "despite the significant progress we have made to date, we are only at the beginning of this new and major era of management advancement." General Schriever also speaks of the "philosophy and policies involved in this approach" to system and program management. It would appear useful, therefore, to make this study into what are the philosophy and policies, principles or guides that are involved in industrial program management.

Limitations of the Study

This study is intended to serve as an introduction to and a familiarization with the field of program management. It is not intended to be a "how to" book or a procedure manual. Rather, it is written to the level of an undergraduate college student or of a new company employee, either of which is without a basic background or familiarity with this subject. These levels are chosen because the present college text books and other literature do not as yet cover in depth the various aspects of this new and major era of management advancement. The new company employee is selected because of

13 Ibid.
14 Ibid.
the growing need for trained personnel as this field expands.

This study recognizes that there is no universal "right way" by which program management is performed. Variations in the specifics of each situation must be given consideration and acted upon accordingly. However, conceiving the ideas and defining and acquiring the various systems do have certain things in common. There may be significant differences in hardware, complexity, personnel, schedules, funding, and the like, but the basic program management techniques can still be applied.

This study is presented from the business management rather than the technical management aspect. It is viewed as industrial program management, or that view from within a company, in response to and in interaction with a contracting government agency. It is presented as a Research, Development, Test, and Evaluation (RDT&E) type of program management, as differentiated from a production type of program management, concerning aircraft, missile, and space systems.

Source of Data

Many of the articles that appear in textbooks and in publications concerning the subject of program management contain a variation of certain accepted and obvious general facts, with only limited, if any,
discussion or analysis of the details or pertinent factors. It is difficult to take issue with themes such as the necessity for good systems or the requirements for personnel of exceptional caliber. Enlightenment, however, is rather limited.

It is intended in this study to examine some of the specific facets of industrial program management. The data is primary in the sense that much use is made of certain actual experiences and philosophies as well as pertinent government publications. Admittedly, drawing conclusions based upon a study of a small sample is limited and subject to criticism. For this reason, there is no rigorous attempt to prove or disprove a hypothesis as such. Instead, there is the attempt to enlarge upon the knowledge concerned with the field of industrial program management.

In a new, developing field such as this, there are as yet few, if any, generally recognized and acknowledged experts. It is hoped, therefore, that the drawing upon personal background, experiences, and study under these circumstances can be regarded as permissible and constructive.

Organization of the Study and Report

The introductory chapter states that the problem with which this study is concerned is the need to
understand and to improve the business management aspects of industrial program management.

Understanding the role of industry in the systems definition and acquisition phases is the subject matter of the second chapter. The concept of program management, the Work Breakdown Structure, and the purpose of the program office precede the discussion of the characteristics of program management.

Understanding is further enhanced by the discussions concerning the organization and administration of program management and its direction and controls. The roles and functions in staffing are discussed next.

A listing of some program management problem areas precedes the discussion on improvements in program management. The drawing of some basic principles or guide lines completes this study, which is then summarized and concluded.
CHAPTER II

THE ROLE OF INDUSTRY IN SYSTEMS
DEFINITION AND ACQUISITION

Evolution of a Typical Weapon System

The "life cycle" phases of conception, definition, acquisition, and operational deployment of a system of any type constitute a complex evolutionary process. Successful completion of the system life cycle from conception to use is a team effort. The team members are the responsible government agency and the industrial contractors who participate in the program. To understand the participation by industry in a program, there should be an understanding of what a program is, how a program comes into being, and what roles industry can be called upon to play.

For the purposes of this discussion, the shortened term "program" is used instead of "program element" to refer to an integrated activity, an identifiable military capability, or a system, composed of a combination of men, equipment, and facilities. A "system" is a composite of equipment, skills, and techniques capable of performing and/or supporting an operational role. The relationship
of the weapon "system" concept to the overall "program" package concept is shown in Figure 1 in Chapter I.

Weapon systems generally are conceived to meet the advance development objectives or specific operational requirements of particular military objectives. These military objectives are determined by the Office of the Secretary of Defense and the Joint Chiefs of Staff to fulfill the national objectives of the United States Government. These military objectives could be current operational requirements or anticipated long-term operational requirements beyond present technical capabilities. They also could be to exploit a significant technological advancement with potential military application. A specific operational requirement would describe the parameters and specific operational or performance characteristics of an aerospace vehicle, weapon, support, or command control system needed to fulfill a near-term operational requirement.¹

Although the initiative generally resides with the government, there are instances when the need or the hardware possibility is recognized first by industry. The same general pattern would be followed in either case.

¹AFSCM 375-3, p. 120
Typical System Acquisition Flow

A typical system acquisition flow would begin with the recognition of a need or possible use. This recognition could come about in various ways, one being a statement of the advance development objectives or of the specific operational requirements involved. The establishing of a System Program Office by the responsible government agency would begin the implementation process. To the System Program Office would be delegated the responsibility for the planning and execution of the total system activity from conception through operational use. The System Program Office would be given as objectives the optimizing of time, cost, and total system performance.\(^2\)

The initial responsibilities of the System Program Office are in the "conceptual" or system feasibility study phase. This phase extends in time from the determination of the broad objectives to the Office of the Secretary of Defense's approval for the start of the next, or definition, phase. It has the following as its objectives and outputs:

**OBJECTIVES:**

- to recognize and define requirements for future systems
- to conceive systems that satisfy requirements

\(^2\)AFSCM 375-3, p. 2.
to stimulate and/or perform development that will make technically feasible the satisfaction of requirements
to select, through study and analysis, those system conceptual designs which will best satisfy the requirements and are feasible and acceptable
to produce plans and documents needed to begin the next life cycle phase

OUTPUTS:

* a validated and thoroughly defined system requirement
* an operationally suitable, technically feasible, and cost-acceptable concept
* a set of thorough analyses of the various cost and performance trade-offs involved
* a preliminary system design, including performance specifications
* a preliminary technical development plan (PTDP) including a preliminary definition plan (PDP)
* substantiation for cost and schedule estimates
* military construction plan (MCP)
a program change proposal (PCP)

a determination and finding (D&F) for procurement

Contractors are called upon to participate in the feasibility studies. The resulting data package is used by interested contractors in bidding for the succeeding "definition" phase.

The "definition" phase has the objectives of defining the detailed cost, schedule, and technical design requirements of the program. It is divided into three parts, all calling for the active participation of industry.

The activities of Phase IA are directed toward accomplishing contract negotiations and awarding definition contracts. Typical activities are:

Preparing initial system and subsystem performance specifications;
Identifying system and subsystem interface performance requirements;
Preparing work statements;

---


4Ibid., p. 6.
Preparing special instructions and data requirements; and
Initiating the procurement plan,
Leading up to Request for Proposals (RFP) to industry.

Accomplishing source selections by competitive procedures and negotiating and awarding definition contracts complete Phase IA.

Phase IB is concerned with the tasks of defining all elements of the program in terms of performance and design requirements, time, and detailed costs. The major output is the contractor's final report covering technical and management areas. The technical report covers such items as trade-off studies, performance specifications of systems, subsystems, and end items, and equipment specifications. The contractor's management plan covers manpower and funding requirements by time periods, schedules of major milestones, organizational and task breakdown structures, and plans for program controls. The output is, therefore, all the documentation required to let a contract for the design and development program during the acquisition phase.

Phase IC is concerned first with the evaluation of the final reports submitted by the various contractors. From this evaluation, contractors are recommended
for the acquisition phase. The Preliminary Technical Development Plan developed in the conceptual phase is now converted into a Proposed System Package Plan. This updated plan represents the accumulated assessed knowledge gained and signifies that the program concept has evolved and has been developed to the point where acquisition of the system can now be considered.

The subsequent review and approval by the Office of the Secretary of Defense leads to the publication of a System Program Directive. This directive identifies the availability of financial and other resources, the importance category, the impact on other programs, and gives other program direction. Based on this directive, the System Program Director issues a System Package Program document. The System Package Program document places in context the integrated and time-phased tasks and resources required of and by all participating organization in acquiring and supporting the approved systems. The desired program control techniques to be used are established. With the definitizing of the development contract, the selection of the contractor, and the awarding of the contract, the transition is made to the acquisition phase, or Phase II, of the system life cycle.

5 AFSCM 375-3, p. 121.
FIGURE 2

TYPICAL SYSTEM ACQUISITION FLOW

Recognition of Need or Possible Use

Based on Advanced Development Objectives or Specific Operational Requirements

Establishment of System Program Office

Conceptual Phase
(System Feasibility Study Phase)

Issuing Preliminary Technical Development Plan Including Preliminary Definition Plan

Definition Phase--Phase I
(Contract Definition Phase)

Phase IA

Issuing Request for Proposal
Awarding Definition Contract

Phase IB

Defining acquisition program elements

Phase IC

Issuing Proposed System Package Plan
Issuing System Program Directive
Issuing System Package Program
Selecting Prime Contractor

Acquisition Phase--Phase II

Undertaking full scale design, development, test, and evaluation
Converting designs and specifications into hardware
Great importance is placed by the Department of Defense on the Project Definition Phase (PDP), Phase I, as a formal step preceding full-scale development in the Acquisition Phase, Phase II. This can be seen from the notes on the directive establishing the Department of Defense policies governing the use of the Project Definition Phase in the management of large development projects. The Notes on the Department of Defense Directive 3200.9, dated February 26, 1964 state:

PDP Objectives: To provide an adequate basis to assure that management decisions to proceed with, cancel, or change development projects are made on a total system and total cost basis which includes realistic cost and schedule estimates and achievable performance specifications backed, in the case of contractor-conducted PDP, by a firm
fixed-price or fully structured incentive proposal for Phase II. Other objectives of the PDP are to:

- establish firm and realistic specifications
- define interfaces and responsibilities
- identify high risk areas
- validate technical approaches
- establish firm and realistic schedules and cost estimates for Phase II
- establish schedules and cost estimates for planning purposes for the total project (including production, operation, and maintenance) 6

Application of PDP: Applies to all new (or major modifications of existing) Engineering Development or Operational System Development Projects, as defined in Department of Defense Instruction 3200.6 "Reporting of Research Development and Engineering Program Information" and estimated to require cumulative Research Development Test and Evaluation financing in excess of twenty-five million dollars or estimated to require production investment in excess of one hundred million dollars—unless requirement for PDP is waived. 7

Department of Defense Directive 3200.9, Project Definition Phase, dated February 26, 1964, is cancelled and superseded, by action of the Secretary of Defense. It is replaced by a Department of Defense Directive, also numbered 3200.9, Initiation of Engineering and Operational Systems Development, dated July 1, 1965. This later Directive elaborates on the basic concepts previously published in the prior Directive. It also renames the

6 CODAM 1, p. 15.

7 Ibid.
Project Definition Phase as the Contract Definition Phase "during which preliminary design and engineering are verified or accomplished, and firm contract and management planning are performed."\(^8\)

The "acquisition" phase is also referred to as Phase II. It begins with the awarding of contracts to industry for the full scale design and development. It ends during the operational phase when the system and management responsibilities are transferred to the designated government agencies and using commands. The activities during the acquisition phase are concerned with transforming the technical design and interface requirements and the performance specifications into the designs and specifications for the hardware. In addition, the hardware itself operating in system performance must fulfill the functional and contractual requirements.

The "operational" phase provides an orderly ending to the system acquisition phase. It begins when the user accepts the first operating unit of a group of identical operating units. It ends when all the conditions of the transition agreement and user turnover agreement have been fulfilled for that specific system.

Present day role of Industry

The present day roles of both the government services and industry have changed to meet the present day needs. The government services are no longer merely the customers. Their increasingly sophisticated needs have given them challenging systems management tasks. These needs have made them dependent upon and partners with industry for increasing amounts of their military capability. The response by industry has been to seriously accept this change from hardware developer to partner on the joint Services/Industry Team during the conceptual, definition, and acquisition phases of system development.

Model Contractor's Organization

The defense industry is characterized by one major problem that is not generally faced by other industries. This problem is the almost unpredictable market for future defense systems or related services which it provides for the various government agencies. Regardless of how sophisticated or comprehensive a system of forecasting is employed, the forecasts obtained by this industry must be tempered by factors beyond this industry's immediate control or knowledge. Typical of these factors are the interactions of our government's
military goals with those of foreign powers, both friendly and otherwise. Technological advances, both ours and those of foreign powers, are likewise important factors. Congressional and executive decisions exert an almost unpredictable influence that must be considered. All this results in a situation peculiar to only this industry. Consequently, it is understandable why this industry is often considered to be unique.

The uniqueness of the defense industry is expressed primarily by an organization designed mainly to meet the needs of its major customers—the various government services and agencies. Likewise, the policies, practices, systems, and procedures governing the internal industrial operations are influenced by and designed to meet the requirements established by these customers. While the manner of thought, expression, and performance might appear at variance with that which might be used in a comparative commercial situation, the criteria for judging appropriateness should be the same in either case. The criteria should be whether or not the desired results are being obtained by the means used. It should be kept in mind that when the customer is willing to, and does, pay for the particulars and peculiarities which he requires and specifies, performance and compliance in these respects become contractual obligations.
For the purposes of this study, a hypothetical company in the aerospace industry will be described and used to illustrate various points in a typical program management application.

The Model Company is a large, multi-division company. It has a corporate structure and various engineering, manufacturing, and research and development divisions. These divisions are functionally organized by major elements which follow technical disciplines, such as electronics, mechanical, and hydraulics. There is a large data processing capacity for both scientific and business systems use. The company produces many products in diversified lines. It has the capability to perform in existing or in new lines of endeavor.

The Model Company has a product line organization. Each of its product lines is the prime responsibility of a particular division. The operations are on a decentralized basis with centralized financial, contracting, administration, and policies functions. Its major customers are the various United States government agencies. Program management is a requirement of the customers on the majority of the existing and contemplated business. Consequently, program management is strongly endorsed and enforced in the company.
CHAPTER III

THE CONCEPT OF PROGRAM MANAGEMENT

The Need for Program Management

In the "Foreward" to the Air Force Systems Command Manual 375-3, General Bernard A. Schriever states

many times we have found the pacing factor in acquiring new weapon, support, and command and control systems is not technology—it is management. All too often technology has been known, but it was not properly put to use because of shortcomings in our management ability.

The particular type of management ability that General Schriever refers to as being needed would be capable of handling a major job of a substantially different nature than that customarily found in industry. The job would be for a limited duration and would involve dealing with one or only a very few customers. The requirements would be both unique and complex and might involve the use of many and different types of skills for varying periods of time. Some of the functions might be used for one time only, whereas others would be more repetitive in their use. Still, equal attention would have to be given to both types of functions. The
resulting end products would be required to conform to and perform to exceedingly rigid specifications of a highly technical nature. The technologies and skills involved might well press beyond the known frontiers of the sciences concerned. The ability to plan and to replan in the light of new and changing developments on a constant and continuing basis would be the way of life for the duration of the job.

Many similarities may be noted between these requirements and the practices in the heavy construction industry. In the construction of dams, air bases, factories, and other such projects, temporary project organizations are generally established under a single leadership to direct and control the activities. During its life, the project organization is so empowered as to serve its immediate and continuing purposes. At the end, when its current purposes are completed and it is no longer needed, the project organization is disbanded or reorganized to serve a new purpose.

The role of a program or project director or manager working along these lines in technical work began to take shape in the mid 1950's.¹ This application and its development were outgrowths of real and existing needs. As such, the intent was more to develop a working tool rather than a theoretical concept.

¹Davis, Role Perceptions of Program Managers, p.2.
While it is in use today, the concept is still in the process of development rather than being in a firm or final form. It has, however, become embodied through Government directives and by Government requirements so that it has taken on a recognizable form, language, content, and set of procedures. Its adoption as a requirement in major systems acquisitions by the various Military Departments and Defense and Space Agencies has implanted this concept firmly into the thinking and the operational practices of the industrial community.

The size and economic power of the Defense establishment is such that it is very effective in having desired courses of action required to be taken by defense contractors specifically and by industry generally. The ability of the Department of Defense to convert into law, regulations, and contracting practices the philosophies and policies which it may originate or support puts it in a very powerful position to affect thought and action on the industrial scene. Whereas the concept of program management may have had on its own sufficient inherent merit to enable it to be accepted and to prosper like any other type of management tool, the official sanction given it confers on it a special status. It is necessary, therefore, for the concept to be studied by industry, and likewise by the business schools, because of the far reaching effects on business practices.
Reasons for Program Management

In 1961 a research project was sponsored by the Western Management Science Center, University of California at Los Angeles, and by Arizona State University. The project was titled *A Preliminary Study of Management Patterns of Research Project Managers in Manufacturing in the Phoenix Area*. The study was made by Keith Davis, Professor and Chairman, Department of Management, Arizona State University.

In the introduction to the study, it was stated that the function of project managers in engineering and scientific work was a relatively new development in management. The general objective of the project "was to investigate work patterns of project managers to determine if there was any consistency in their work requirements and to discover if there were areas meriting further research."\(^2\) The Abstract stated that since the research was quite limited in scope, the conclusions should be interpreted with this fact in mind. Four of the resulting seven tentative generalizations that were developed can be used to help explain the need for program management.

\(^2\) Davis, Management Patterns of Research Project Managers, p. 2.
The most important conclusion appears to be that

the primary management reason for project management organization is to achieve some measure of managerial unity, such as unity of communication, control, direction, and/or command.\(^3\)

Program or project management organization is, therefore, the centralization of all related systems activities into one area. This "one area" assumes in size and shape the form of a large triangle, with the System Program Office at its peak. The various layers down towards the base are composed of the participating Government Agencies and industrial contractors. These parallel in general, but on a smaller scale, the structure and the procedures of the overall organization. Through these interfacings, managerial unity is achieved.

A second important conclusion is that

the function of project manager requires a balancing of technical solutions with time, cost, resource, and human factors. The project manager is an integrator and a generalist, rather than a technical specialist.\(^4\)

\(^3\)Ibid., p. 9.

\(^4\)Ibid., pp. 11-12.
The program or project manager works with others to achieve a balance of all interests in the project. Projects by their very nature involve highly technical areas and disciplines. It is most natural and in many instances necessary for the men selected as project managers to have mainly technical backgrounds and experience. It is necessary, therefore, for the managers making the selections, as well as those selected, to be fully convinced of the necessity for giving priority to the management rather than the technical aspects of the job. A technically perfect project, poorly managed, could be evaluated on an overall basis to be on a level with another project with a poor technical performance.

A third conclusion is that "project managers devote most of their management time to the functions of planning and control." Planning is considered to be "the function of selecting enterprise objectives and the policies, programs, and procedures for achieving them." Included is the rational process of making any required decisions. Controls are "the measurement and correction

5Ibid., p. 13.

of activities of subordinates to assure the accomplishment of plans. In practice, the work packages are spread out into the various areas where the job responsibilities are. The Program or Project Manager makes the assignment decisions. He also assures that a reporting system exists that enables the performance to be visible and measurable. In this manner he helps achieve his managerial unity.

A fourth conclusion is that

A project manager reaches others to explain plans and to accomplish control only through the activity of communication. . . . face-to-face communication is the principal communication method by which the project manager accomplishes his management job.

While time is of value and importance in most areas of endeavor, it is especially so in a program or project situation. By definition, programs or projects have finite time limitations. The use of face-to-face communication speeds up the inquiry and response activity. It makes for fast action and reaction. Without question, the ability to meet on a face-to-face basis also enhances the team feeling and effort which characterize a program.

7 Ibid., p. 37.

or project organization. But most of all, it is not what is said but what is understood that is important. The process of communication, forward and feedback, is the essential means of assuring that the understanding is mutual.

**Definitions of Program Management**

**Clarification of Program and Project relationship**

The terms "Program" and "Project" are used individually and in association with other words, such as "Manager" and "Office." It is well to clarify the context regarding the usage of these two terms.

The term "Program" is used in the larger sense to denote the integral program. This usage refers to the integrated activity, the identifiable military capability, or the total system, composed of a combination of men, equipment, and facilities.

The term "Project" is used to refer to a portion of a program or to one part of an aggregated program. A program is generally made up of two or more projects. Projects, in turn, are sub-divided into smaller units. These units may be called "tasks" or "work packages." A task is work assigned by one organization to itself or to another organization. Work packages are detailed short span jobs, or purchased material items, identified by a
contractor and controlled by him in assigning work within his organization and in accomplishing work required to complete the contract.9

To illustrate the use of these terms, a particular "Missile System" could be considered to be a "Program." The "Missile" and the "Launcher" involved could be considered individually as "Projects." Within the "Missile Project," the "Airframe," the "Propulsion," and the "Guidance" could be considered as "Tasks" or "Work Packages."

In some of the earlier publications on program management, the distinction between "program" and "project" was not always clearly observed.10 In some instances the terms were used interchangeably, although in fact they were not. In this study the terms "Program" and "Project" will be used as defined above.

Development and changes in definitions

Over a period of time, as the concept of program management developed, changes appeared in some of the


10For examples, Keith Davis, Management Patterns of Research Project Managers, and Keith Davis, Role Perceptions of Program Managers.
definitions applied to this concept. These changes in definition and meaning represented the changes in the thinking that were taking place during this period of trial and development.

In his Preliminary Study of Management Patterns of Research Project Managers in Manufacturing in the Phoenix Area, published in November, 1961, Professor Keith Davis studied the manager's job to determine what his functions or work activities were in his role as a manager. Professor Davis described project management in terms of the project manager's job. He stated

the project manager generally has complete managerial, budget, and technical responsibility for directing a specialized research or development project. The mix of his group is tailored to fit one specific job, and when that job is finished, he is returned to his "permanent" job or another project, usually with a different mix of specialists, depending on the requirements of the new project. His function is to balance business factors with scientific solutions to problems.11

In his Role Perceptions of the Job of Program Manager (Project Manager) in Technical Work, Professor Keith Davis defines project management. The definition of project management is quoted as

a general management activity encompassing planning, control, supervision, and the

11P. 2.
The quoted definition is referenced to John Stanley Baumgartner's book, *Project Management*, published in 1963. While the brevity is to be admired, the descriptive quality is of a more general, less informative nature.

The trend toward brevity in definition is further illustrated in the definition by an industrial contractor, as published in an internal company policy document in 1964. This states:

"A Program/Project is the total work effort to be performed as defined and funded by sales contracts and/or by the Company."

This definition limits the meaning expressed but allows for an expansion in understanding by reference to an unspecified and unlimited number of other amplifying company definitions, descriptions, and the like. It indicates the possibility of more than one meaning being applicable to this concept, "as defined and funded by sales contracts." The addition of the words ". . . and/or by the Company" tends to indicate elements or areas of

---

12P. 2.

generality in the application of the concept to other than just Government contracts.

In May, 1965, the Department of Defense issued a Directive, Number 5010.14, on the subject, System/Project Management. The stated purpose of this Directive was to establish Department of Defense policy governing the use and application of System/Project Management. The definition given for this concept was a definite reversal of the trend toward brevity and generality. The Directive stated:

System/Project Management: A concept for the technical and business management of particular systems/projects based on the use of a designated, centralized management authority who is responsible for planning, directing, and controlling the definition, development, and production of a system/project; and for assuring that planning is accomplished by the organizations responsible for the complementary functions of logistic and maintenance support, personnel training, operational testing, activation, or deployment. The centralized management authority is supported by functional organizations, which are responsible to the centralized management authority for the execution of specifically assigned system/project tasks.14

This definition reflected the expansion in understanding and in application that had both taken place in the present and taken plan for the future. While it contained

---

general statements, these were general in stated particular areas. The intent, inclusions, and applications became more direct as the vocabulary, policies, and procedures took on a more mature form and content in the development process.

The maturity in the development process was further reflected in the subsequent revision published by the previously quoted industrial contractor. In a management directive published in August, 1966, the definition given was

Program--an overall planned undertaking to accomplish a defined area of work in a specified time period as determined either by a customer awarded and funded plan or an approved Company funded plan.15

In this definition, recognition has been given to the facts that program management is a planned activity, that is has particular and specific requirements, and that these must be fulfilled in accordance with an agreement with a customer or as part of an approved company plan. The application of the concept and definition of "program" to company funded plans is significant.

In brief review, the course in the definition of the program management concept has ranged in the earlier period from a detailed general description to a brief statement of generalities. These have been replaced at the present time by more comprehensive statements that recognize a specific, designated centralized management authority that requires conformity and compliance.
CHAPTER IV

THE WORK BREAKDOWN STRUCTURE

The Necessity for a Unifying Structure

A system is defined as a composite of equipment, skills, and techniques capable of performing and/or supporting an operational role.¹ Under certain conditions, new or major modifications of existing production systems, or new systems being developed, are managed in accordance with Department of Defense Directive Number 5010.14, "System/Project Management." The most important of these determining conditions is the implementing of approved national and military urgency determinations. Another determining condition is the amount of financing required; estimates in excess of twenty-five million dollars for Research, Development, Test, and Evaluation or estimates in excess of one hundred million dollars for total production investment qualify a program.

There are also other conditions which require designation by the Secretary of Defense or the Head of a Military Department or Defense Agency to qualify for this

¹AFSCM 375-3, p. 120.
type of exceptional management. These "otherwise designated" situations are basically concerned with having a significant effect on United States military posture, with the anticipation of significant technical problems, organizational complexities, or technological advancement, and with similar types of critical, costly, and exceptional situations.

Under such circumstances of urgency, costliness, criticality, and exceptionalism, there is a definite need for a cohesive agent. This cohesive agent is the integrated Work Breakdown Structure which basically is the framework of the program or project. This framework identifies the work required to accomplish the various objectives. It assists in time-phasing the work requirements and in scheduling the performance or delivery of the necessary items. It helps in establishing the cost factors and the budgets concerning the work planned and the cost limitations. It displays the logical areas for establishing the responsibility assignments, controls, and reporting techniques. It is, in short, the graphic presentation of the program or project relationships, interdependencies, and objectives.

A Work Breakdown Structure is formally defined as

a product-oriented family tree division of hardware, software, services and other work tasks which organizes, defines, and graphically displays the product to be
produced as well as the work to be accomplished in order to achieve the specified product.\textsuperscript{2}

A less formal but more descriptive definition is contained in the Cost Information Reports publication which states:

A work breakdown structure is an organized array which identifies hardware, software, and services produced or performed during the development and production phases of a weapon system program. These hardware, software or service components are designated as work breakdown structure elements. They are aggregated into groups of similar items (air vehicles, training, support equipment, data, etc.) which are called major elements.\textsuperscript{3}

The need for a Work Breakdown Structure as a cohesive factor under conditions wherein program management is optional, just as when it is mandatory, is obvious. Given sufficient time, without regard for costs, complexities, or complications, many of the problems facing defense industry planners could eventually be solved and the objectives eventually be reached. However,


\textsuperscript{3}U.S., Department of Defense, Cost Information Reports (CIR) for Aircraft, Missile, and Space Systems, Budget Bureau Number 22-F260, April 21, 1966, p. 54.
when practical operating limitations forced by real life situations are imposed, planning becomes of necessity the prime requisite, the essential tool for defining, organizing, and directing. The Work Breakdown Structure that evolves may be regarded as an embodiment of the planning function. It is possible that the single, most important element in the program management concept is the Work Breakdown Structure.

The Integrated Framework

There are in practice, readily available for use, a variety of management information systems. With proper adaptations to specific situations, any one, or combination, could be used to serve management purposes. The particular choice of systems and techniques for a given application usually is dependent upon a variety of different factors. The selection in each instance is best judged by its ability to serve the intended purposes.

The possibility exists, therefore, that several contractors working on the same program or project could very likely be using different internal operating systems. The responsible System Program Office could then be in the position to be receiving as its inputs a variety of dissimilar outputs from the various participating contractors. Obviously, the more compatible and similar the inputs received, the more intelligible and useful these
would be for the System Program Office's use. To assure that this happens, the upper three levels of the Summary Work Breakdown Structure are prescribed by the Proposed Military Standard, MIL-STD-881, dated July 21, 1967. This provides uniform element terminology, definition, and structural placement for the System Program Office at the upper levels of the structure.

At the lower levels of the Work Breakdown Structure, flexibility must be available to assure adaptability to the individual situations encountered by the different contractors participating in the program. This is accomplished by allowing individualized Work Breakdown Structures for each contract that permit traceable summarizations into the higher levels of the prescribed program structure. At the same time, the structure for each contract can be adapted to or be used as an integral part of the contractor's internal control system. The outputs of the contractor's system would then provide the inputs to the customer's system.

Types of Work Breakdown Structures

The proposed Military Standard, MIL-STD-881, states that its purpose is

to establish criteria for the preparation and requirements for employment of Project

4p. 2.
Work Breakdown Structures (Project WBS's) and Contract Work Breakdown Structures (Contract WBS's) in conjunction with other techniques for planning and control during the concept formulation and acquisition (Engineering and Operational Development and follow-on production) of selected defense materiel items. 5

The purpose acknowledges that there are different types of Work Breakdown Structures. The questions are naturally raised as to what are the different types and why, when, and how are they used. The statement, "... in conjunction with other techniques for planning and control. ..." confirms the previous discussion that Work Breakdown Structures are only frameworks or organized arrays. The Structures assist, help, identify, display, and the like but they do not, on their own, perform program or project management.

The proposed Military Standard further states:

Two broad areas exist for the application of Work Breakdown Structures: (a) to provide a more effective management and technical base for operations within those government offices and by those contractors responsible for the acquisition of defense materiel items, and (b) to provide a framework for cost and progress reporting to management to facilitate interpretation and reconciliation of all reports received. 6

5 P. 1.

Usage as a management and technical base and as a framework for cost and progress reporting has already been briefly discussed and will be further discussed in the course of this study.

As to the types of Work Breakdown Structures, there are four:

2. Project Summary Work Breakdown Structures.

These will be individually discussed as to meaning, relationships, and use.

**Summary Work Breakdown Structure**

The Summary Work Breakdown Structure is distinguished by several definite features. First of all, it is the top type of Work Breakdown Structure. As such, it is rather brief in nature. It has only three levels in its composition. The elements comprising these three levels, and a definition of the meaning to be used for each element, are prescribed for certain specified types of systems. Examples of the specified systems are Aircraft, Electronics, Missile, Ordnance, Ship, Space, and
Surface Vehicle Systems. The Summary Work Breakdown Structure for a Missile System, as set forth in the proposed MIL-STD-881, Appendix C, is shown in Figure 3.

FIGURE 3

SUMMARY WORK BREAKDOWN STRUCTURE--MISSILE SYSTEM

Level 1

Missile System

Level 2

Air Vehicle

Level 3

Airframe
Propulsion (Specify by Stage, If Appropriate)
Guidance & Control
Launched Payload
Airborne Test or Training Equipment
Integration Assembly Grouping
Other

7 Ibid., p. v.
8 Ibid., Appendix C.
FIGURE 3—Continued

Command & Launch Equipment
(Specify by Major Items
of Equipment, as
Applicable)

| Surveillance, Identification & Tracking |
| Data Processing |
| Launch & Guidance |
| Control |
| Launcher |
| Communications |
| Integration Assembly |
| Grouping |
| Other |

Peculiar Support Equipment

| Organizational/Intermediate |
| Data Processing |
| (Including Equipment Common to Depot) |
| Depot (Only) |

Common Support Equipment

| (Breakdown as Peculiar Support Equipment Above) |

Systems Test & Evaluation

| Development Tests |
| Technical Evaluation |
| Operational Evaluation |
| Test & Evaluation Support |
| Mock-Ups |
| Other |

Systems Engineering/Management

| Systems Engineering |
| Program Management |
| Other |

| Training | Equipment  
|          | Services  
|          | Facilities  
|          | Other  
| Data     | Technical Orders & Manuals  
|          | Engineering Data  
|          | Management Data  
|          | Data Depository  
|          | Other  
| Operational/Site Activation | Site Construction/Conversion  
|          | (Specify by Site)  
|          | System Assembly, Installation & Checkout on Site  
|          | Ship/Vehicle Conversion  
|          | (If Applicable)  
|          | Contractor Technical Support  
|          | Other  
| Industrial Facilities | Construction/Conversion/Expansion  
|          | Equipment Acquisition or Modernization  
|          | Maintenance  
|          | Other  
| Spares & Repair Parts | (Specify by Allowance List Grouping or Hardware Element)  
| Other    |
Missile Category--Those weapons delivery systems which employ unmanned, self-propelled air vehicles to navigate, penetrate and produce a desired destructive effect on selected targets. Includes such systems designed for employment as weapons of air defense, land warfare, strategic bombardment, and air and sea combat.

Missile System--The complex of equipment, software, services, and facilities required to develop and produce the capability of employing a missile weapon in an operational environment so as to produce the desired destructive effect on selected targets. Represented by Poseidon, Minuteman II, Nike-X, SRAM, Phoenix, etc.

Air Vehicle--The means for delivering the destructive effect to the target including the capability to generate or receive intelligence, to navigate and penetrate to the target area, and to detonate the warhead. Includes design, development, and production of complete units (prototype and operationally configured units which satisfy the requirements of its applicable specification(s), regardless of their end use).

Airframe--The vehicle body structure including external appendages for stable and controllable flight, scoops, penetrations, fittings and interior accommodations for other subsystems. It also includes the group of subsystems which provide services to the primary subsystems. Includes such functions as electric power generation and distribution, environmental control for atmospheric conditioning and shock.

alleviation. Also includes stage separation systems.

Propulsion--The means for generation of propelling forces including for example engine structure, propellant and fuels, distribution and control of propellant and fuel, starting means, safety devices, lubricating means, and internal environmental control.

Guidance & Control--The means for generating or receiving guidance intelligence, conditioning the intelligence to produce control signals, and generating appropriate control forces. Controllers may interface with the airframe by actuating movable aero surfaces or with the propulsion system to produce control reaction forces or may independently produce reaction forces for control. If design is such that electronics are packaged into a single rack or assembly, this rack will be considered part of the guidance and control system, but the circuit boards and CRT will be considered as part of the appropriate subsystems. Includes, for example, the guidance intelligence system, computer, sensing elements, autopilot, etc.

System Test & Evaluation--The use of prototype, production, or specially fabricated hardware to obtain or validate engineering data on the performance of the prime mission equipment. Includes the detailed planning, conduct, support, data reduction and reports from such operations, and all hardware items which are consumed, or planned to be consumed, in the conduct of such operations. Also includes all effort associated with the design and production of models, specimens, fixtures and instrumentation in support of the test program. Does not include test articles which are complete units (that is,
functionally configured as required by the prime mission equipment). Also excludes development, component, acceptance, etc. testing which can be specifically associated with the hardware element, unless these tests are of special contract or engineering significance.

**Development Tests**—The use of prototype equipment to acquire engineering data and confirm engineering hypotheses. Encompasses Category I Test (Air Force), and includes such tests as wind tunnel, hydrostatic, fatigue, integration, flight and ground tests.

**Technical Evaluation**—Evaluation of the performance characteristics of production (or near production) configured hardware, culminating in government acceptance of contractual performance requirements. Encompasses Category II Test (Air Force), Navy Preliminary Evaluation and B.I.S., and Army Engineering/Service Test, and includes such tests as flight tests, spin demonstrations, stability tests, sea trials, range and accuracy demonstrations, etc.

**Operational Evaluation**—Evaluation of production hardware by the ultimate user to demonstrate the system performance and the tactical use of the system under operational conditions. Encompasses for example: Category III Test (Air Force); OPTEVFOR Evaluation (Navy); and troop testing (Army); and includes such tests as flight tests, sea trials, etc.

**Test & Evaluation Support**—All support elements necessary to operate and maintain systems and subsystems during testing and evaluation which are not consumed during a particular category of
FIGURE 4--Continued

testing. Includes for example, instrumentation, facilities, repairable spares, test and support equipment, contractor technical services, chase aircraft, test bed aircraft, etc. Excludes such items as operator and maintenance personnel, consumables, special fixtures, special instrumentation, etc., which are utilized and/or consumed in a single category of testing, and which should therefore be included under that category.

Mock-Ups--The design engineering and production of system or subsystem mock-ups which have special contractual or engineering significance, or which are not required solely for the conduct of one of the above categories of testing.

Other (System Test & Evaluation)--System or subsystem test and evaluation work elements which do not logically fall within one of the above categories, but which have contract or engineering significance.

Systems Engineering/Management--The technical, scientific, and administrative efforts normally performed by an overall prime or system contractor which are associated with the conceptual and acquisition phases of the program. This includes for example those contractually performed efforts related to: overall system design; the identification and definition of specific items of equipment, components and supporting items to satisfy the operational requirements; the system analysis and evaluations performed to insure that the specified subsystems and equipment will satisfactorily interface with the system; and the system interface between this and other systems in the operational inventory. Excludes Systems Engineering/Management efforts which can be specifically associated with the hardware element.
FIGURE 4--Continued

Systems Engineering--All feasibility, research, and development activities directly contributing to the overall system and all scientific and engineering services to integrate the entire project. Examples of specific Systems Engineering activities are: Special Studies, Systems Analysis, Systems Integration, Human Engineering/Life Support, QOPRI, Safety Engineering, Value Engineering, Logistics Support Program, Maintainability Program, Quality Assurance Program, Reliability Program, System Test Plans & Objectives, General Systems Engineering/Technical Direction, Advance Product Engineering, Production Planning & Analysis, Facility Design, Weighing, Engineering Calculations, and Special Weapons/AEC Coordination.

Program Management--The process of planning, organizing, coordinating, controlling, and approving administrative actions designed to accomplish overall project objectives. Examples of specific Program Management activities are: Configuration Management, Cost/Schedule Management, Data Management, Project Office, Contract Compliance, Vendor Liaison, and the Transportation & Packaging Program.
A Summary Work Breakdown Structure is not used in the same sense or in the same manner that the other types are used. Rather, its main purpose or use is to serve as a guide in preparing a Project Summary Work Breakdown Structure for a specific application to a weapon system, support system, or other such designated material. It is not necessary to include in the Project Summary every item shown in the top Summary structure. Only those items required and applicable are used and, as such, are identified with the prescribed uniform nomenclature, definition, and structural placement. Deviations are permitted when necessary because of an item's unique configuration, activities, or other requirements. Consideration is also given when additional structure elements are needed or desired. During Contract Definition or equivalent proposal action, contractors may propose alteration of the Project Summary Work Breakdown Structure to enhance the effectiveness of the Project Summary Work Breakdown Structure in satisfying the objectives of the particular development.\(^\text{10}\)

The uniform element terminology, definition, and structural placement of the Summary Work Breakdown Structure are:

\(^{10}\)Ibid., p. 7.
Level 1—The entire defense materiel item, e.g., the FDL Ship, the Minuteman ICBM, or the M-16 rifle system including its round. Level 1 is usually identified in the DoD programming/budgeting system as an integral program element or as one project within an aggregated program element.

Level 2—Major end item oriented elements of the defense materiel item, or aggregations of services, data and activities, e.g., a vessel, an air vehicle, the M-16 rifle, or systems engineering/management. Level 2 elements may be specified as contract line items.

Level 3—Major end item subsystem elements or types of services, e.g., an electric plant, an airframe, the M-16 rifle magazine, or systems engineering. Level 3 elements may be specified as contract line items.

for the following categories of defense materiel items:

a. Aircraft

b. Electronics
c. Missiles  
d. Ordnance  
e. Ships  
f. Space  
g. Surface Vehicles

Contract end items, major end items, or end items refer to items specified in a contract to be delivered by a contractor. Contract line items refer to overall systems efforts rather than to individual hardware elements or efforts relating to a contract.

Project Summary Work Breakdown Structure

The Project Summary Work Breakdown Structure is defined in the Proposed MIL-STD-881 as

The WBS [Work Breakdown Structure] for a specific defense material item which has been prepared by the DoD Components [formerly referred to as Military Departments and Defense Agencies] in accordance with this Standard by selecting (based on systems engineering during concept formulation or its equivalent) applicable elements from one or more Summary WBS.12

To fully understand this and other definitions, terms, and expressions which are part of the language of

11 Ibid., pp. 2-3. (Italics mine.)  
12 P. 3.
program management, a word of explanation is in order. Students of the various engineering and scientific disciplines, in the course of their training and in their subsequent work, use a variety of terminologies, definitions, and expressions which to them have distinct and significant meanings. With this language, trained or familiar personnel communicate and understand both generally and specifically the intended meanings. Students of Business Administration and of other fields of learning can, and must, become familiar with this language and its meaning if they are to successfully participate in the area of program management. Some of the terminology is intentionally included in this study to give exposure, familiarity, and reality, and because of the necessity for understanding.

The term, "systems engineering," used in the definition above covers an important activity in program management. Systems Engineering is defined as

all feasibility, research, and development activities directly contributing to the overall system and all scientific and engineering services to integrate the entire project. Examples of specific Systems Engineering activities are: Special Studies, Systems Analysis, Systems Integration, Human Engineering/Life Support, QOPRI [Qualitative and Quantitative Personnel Requirements Information], Safety Engineering, Value Engineering, Logistics Support Program, Maintainability Program, Quality Assurance Program, Reliability Program, System Test
A Project Summary Work Breakdown Structure, therefore, is the top structure for a specific weapon system resulting from the applicable systems engineering activity and the subsequent selection of the necessary structural elements. The necessary structural elements are those elements which represent the configuration structure and the reporting framework of the project. The configuration is the technical description required to fabricate, test, accept, operate, maintain, and logistically support the system/and or equipment. The reporting framework is the designation for the particular weapon system of the Level 1, 2, and 3 items to which the participating contractors will be required to report.

Contract Work Breakdown Structure

The Contract Work Breakdown Structure is defined in the Proposed MIL-STD-881 as

the WBS [Work Breakdown Structure] which is prepared by the DoD Component by selecting elements from the Project Summary WBS and specified in the individual contract and which, when extended

---


14 AFSCM 375-2, p. 118.
by the contractor in accordance with this Standard, represents the complete WBS developed and used by the contractor. 15

A separate Contract Work Breakdown Structure may be used for each procurement action. Since different procurement actions could each be for different portions of the Project Summary, it would naturally follow that the various contract structures, to be appropriate, would likewise be different.

The Project Summary Work Breakdown Structure would be used as a guide in the preparation of the various parts of all the contracts to be issued to implement it. It would provide the basis for the statements of work to be performed under these contracts. It would aid in determining the items of hardware, data, and the like that are to be delivered. The configuration structure or technical descriptions of the hardware items at the contract level would be the same as those shown for the same items on the Project Summary level. The cost information and program planning and controls reporting frameworks would tie in with those on the Project Summary Level.

The proposed Contract Work Breakdown Structure would be included by the DoD Component in the set of documents known as a Request for Proposal. A Request for

15 AFSCM 375-3, p. 3.
Proposal contains a comprehensive work statement, an exact description of the items or services to be procured, and other pertinent information, such as applicable specifications and time and place of delivery. The contractor's proposal, to be fully responsive, must reply to the request in the manner requested. Exceptions, if taken, should be clearly indicated. The response should follow the proposed Contract Work Breakdown Structure. In this manner, responses from different contractors can be compared and evaluated on a similar basis.

The Contract Work Breakdown Structure is extended in number of levels by the contractor in a manner consistent with the contract. The important considerations are the specific contractual, technical, and management requirements for the particular item or system involved. The number of levels should be as many as are required to manage and control the program or project.

A typical way to extend the Contract Work Breakdown Structure would be to divide the work statement or the end objectives of the Request for Proposal into the various discrete tasks involved. The subdivisions should reflect the way the work is actually to be performed and

---

16 Ibid., p. 68.
should be manageable units of functional tasks. The tasks should be of a nature that would permit delegation to a specific organization that by virtue of its operating charter, qualifications, equipment, and personnel would be best qualified to accomplish them. While an organization could be responsible for many tasks, each task should be clearly the responsibility of only one organization.

Project Work Breakdown Structure

The Project Work Breakdown Structure is defined in the Proposed MIL-STD-881 as

the detailed WBS [Work Breakdown Structure], compiled by the DoD Component for a specific defense materiel item, which initially is the Project Summary WBS and which evolves, through systems engineering and contractual processes, into a WBS containing all elements of all extended Contract WBS(s). 17

The aggregating process occurs by adding to the original Project Summary Structure the successive extensions of the individual Contract Structures as they occur. The result is a continuing compilation of a detailed Work Breakdown Structure for the specific weapon system. The final Project Work Breakdown Structure

17p. 3.
serves to relate the specification tree and elements under configuration management with the administrative organization of the project.\textsuperscript{18}
CHAPTER V

PURPOSE OF THE PROGRAM OFFICE

The System Program Office

In Chapter II it is stated that a System Program Office is established by an appropriate responsible government agency. To this System Program Office is delegated the overall responsibility for the planning and execution of the total system activity from conception through operational use. As objectives, this office is given the optimizing of time, costs, and total system performance. Other purposes are the prevention of voids in planning and in performance. Of great importance is the assignment of responsibilities by this Office to the various participants for the various levels and tasks required to be performed by them.

Initiation of System/Project Management

The Head of the Department of Defense Component which has cognizance over the particular type of system or project under consideration approves and issues a System/Project Manager Charter when the program qualifies
for this type of management action. A System/Project Manager Charter is defined as

the document approved and issued by appropriate authority that establishes a System/Project Manager and his management office; defines his mission, authority, and major functions; and describes his relationships with other organizations and their support responsibilities.¹

The Manager's Charter also sets forth the provisions for control by the manager of the allocation and use of the resources approved and authorized for the system or project. Any necessary special delegations of authority or exemptions from regulations within the authority of the Component Head to grant are likewise explicitly set forth.² The Component Head is responsible for periodic reviews and termination of this management technique when the principal objectives are achieved.

The System/Project Management Directive 5010.14 sets forth some specific guidance on the selection of the System/Project Manager and his staff and how the staff's size and organization should be determined.

Regarding the selection of the System/Project Manager and his staff, they

²Ibid., p. 5.
should have sufficient rank/grade and organizational stature to meet the needs of functional parity. . . .

It is mandatory that the System/Project Manager and his staff have a high degree of technical and business managerial competence, supplemented whenever possible by recent experience in system/project management, and by training in the special requirements of such management. Personnel considered for assignment should be those who can be expected to be available for at least three years.³

The term "functional parity" is defined as

a basis for determining the rank/grade structure, size, and quality of personnel required for a System/Project Management Office so that the System/Project Manager and his full time staff will possess sufficient technical and business managerial competence and stature to deal effectively with staff, field, and functional personnel who must support the system/project; and enable the Manager independently to make substantive decisions regarding the direction and control of system/project efforts by in-house and contractor organizations.⁴

Regarding the staffing, that portion of the guidance given concerning the size and the organization is obvious and logical. It states:

The size, scope, functions, and relationships of a System/Project Management Office, including representation from participating organizations, shall be tailored to meet the needs of the

³Ibid., p. 7.

⁴Ibid., p. 3.
particular system/project. The System/Project Manager should have a primary role in the selection and tenure of his key subordinates and in the determination of the organizational structure of his office and the functional assignments within it.

In Chapter I it is stated that the government has endeavored to minimize its own control and monitoring efforts in certain areas of the defense and aerospace industries by establishing what is known as the "weapons system concept." This is the approach that has one contractor, commonly called the "prime contractor," assigned the role of weapon system manager and made responsible for the proper overall development of that particular weapon system. However, as this study has shown, this prime contractor does not have complete and overall performance freedom. He must operate within certain boundaries and perform, record, and report at certain times in certain ways. This does not mean that this is necessarily bad or without merit. What it does mean is that the government has established, and is continuing to up-date and further establish, a growing body of rules, regulations, criteria, and specifications to govern what has now become a contractual obligation.

The process of initiating system or project management within government agencies, as briefly outlined

5 Ibid., p. 6.
above, has its counterpart processes in the affected defense and aerospace industries. Regardless of the rationale used in establishing these industrial installations, the criteria used by the reviewing and approving government agency are directly influenced by the comparable government organizations and pertinent publications.

**Industrial Counterpart of the**

**System Program Office**

**Purposes of Industrial Program Office**

Many of the reasons for the creation of a government Systems Program Office could be documented by reference to various Department of Defense Directives, government agency manuals, and similar types of publications. Few of the reasons for the creation of a Program Office in an industrial situation are so readily capable of documentation.

The prime reason for the parallel creation of a Program Office by a contractor is simply because it is a part, in the applicable situations, of the contractual requirements. A Department of Defense Directive is very clear on this point. In the Directive enclosure titled,  

---

Information in the Request for Proposal for Contractor- Conducted Contract Definition, the pertinent specific comments are:

It is essential that information be included in the Request for Proposal (RFP) on which potential contractors may base high quality proposals. Both technical and managerial aspects of the proposed Engineering Development must be considered thoroughly in the RFP and the resultant proposals. The RFP shall include, but shall not be limited to, the following items (except as specifically exempted by the DDR&E):

4. Outline of the Government's plan for system/project management, including identification of pertinent Government organizations and communication channels within the Government and between Government and contractors.

11. Statement of the Government's requirements for system/project management.7

In the Directive enclosure titled, Information in the Proposal Package, the pertinent specific comments are:

The proposal package for Engineering Development shall contain but shall not be limited to, the following items (except as specifically exempted by the DDR&E):

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7Ibid., Enclosure 1, p. 1.</td>
</tr>
<tr>
<td>----------------------------------</td>
</tr>
</tbody>
</table>
17. Participant commitments for managing the project including:

(a) Planned participant project-management structure and organization.

(b) Key project management and technical personnel by name and experience, together with statements of responsibility and authority for Engineering Development.

(c) Management-control and cost-control techniques, including reporting procedures.  

There are other reasons for or purposes served by an industrial Program Office that can be surmised. Visibility and control of business commitments is enhanced by program management techniques. The requirements for plans, details, and facts in themselves bring on attention that might not otherwise be given to the program to such a depth or extent. The systematic analyses of performance to plan and the explanations for variances focus emphasis on performance and again on plans. The existence of a system and the connotations that go with a system, in the eyes of the customer, help to maintain business integrity in reporting progress, costs, and status. The summarizations of business efforts for management's use is especially important for planning, controlling, and making decisions.

---

8Ibid., Enclosure 2, p. 3.
However, there are some objections being raised by industry. In a comment in Newsweek, dated October 9, 1967, it is stated "the Pentagon and its defense contractors are embroiled in a new squabble about the way contracts are administered."\(^9\) Defense Department officials have urged industrial contractors to develop more sophisticated management information systems to enable, on short notice, finding out just how well a contract job is going. Industry is rebelling on the basis that such systems would be too costly and would reveal too much information to competitors. Some companies are even threatening to stop bidding for defense business because of the red tape and interference involved.

**Basic considerations applied to company business activities**

Two of the basic considerations applied to a company's business activities have a very direct and distinct effect on industrial program management. These are:

1. The company product lines determinations.
2. The class of company business determinations.

A product line is the classification by common technologies, markets, or similar types of criteria by a

\(^9\)"Riding Herd on the Contractors," p. 69.
company of its products or services into practical or desirable related groupings. These determinations are essential for defining the areas of desired business activities. The determinations may be based on available or proposed facilities, personnel, and similar tangible considerations or on management or policy decisions. Within the company, the product lines determinations make for efficient internal operations through the clear assignments of responsibilities to specific organizations.

Company business classifications can be made in various ways, depending upon the subjective and objective criteria used. Three criteria that could be used in common are:

1. Management approval requirements.
2. Risk or contractual status.
3. Funding requirements.

Some degree of pre-approval by management exists, based on product line determinations. Individual decisions must be made for other situations. The management approval requirement criteria is important because it involves the commitment of a company's capabilities, resources, and integrity.

The risk or contractual status means the arrangement agreed upon for determining the price to be paid for a product or service. When contracting with a government
agency, one of the primary factors affecting the selection of the type of contract is confidence in the price, which is dependent upon the detailed definition of the task.\textsuperscript{10} There is a direct relationship among the program phase, availability of data, confidence in the price, and type of contract most suited to the procurement.\textsuperscript{11} The types of contracts generally used by government agencies are Letter Contracts, Cost Plus Fixed Fee Contracts, Incentive Contracts, and Fixed Price Contracts.

While it is government policy to issue definitive types of contracts, there are instances when the use of a Letter Contract is necessary. A Letter Contract is a preliminary contractual instrument which authorizes immediate commencement for manufacture of supplies or performance of services.\textsuperscript{12} The execution of a definitive contract as agreed to by both parties is intended to follow. A Cost Plus Fixed Fee contract is used when data is not available upon which to establish a complete work statement and permit accurate pricing.\textsuperscript{13} The contractor is reimbursed for allowable costs and is paid a fixed fee.

\textsuperscript{10}AFSCM 375-3, p. 67.
\textsuperscript{11}Ibid.
\textsuperscript{12}Ibid.
\textsuperscript{13}Ibid.
On Incentive Contracts, the contractor is motivated to perform more efficiently and to participate in the cost savings in accordance with the incentive provisions of the contract. Fixed Price Contracts represent an agreement by the contractor to furnish designated materiel or services at a specified price.\(^{14}\)

Funding requirements are concerned with the source and amount of funding involved. The source may be either customer or company provided funds, and may be either partial or full funding. The extent and the amount may directly affect the level of management approvals that may be required to commit or obligate the company. Funding requirements also are concerned with how firm, potential, or speculative the endeavor may be. The degree of certainty is a consideration behind every commitment affecting the acquisition, use, and disposition of company resources.

\underline{Determination of Program Management responsibility}

To illustrate the determination of program management responsibility within the Model Company described in Chapter II, it is repeated that the Model Company has a product line organization, with each product line the prime responsibility of a particular division.

\(^{14}\) Ibid.
Each Request for Proposal, upon receipt, is classified into an appropriate Product Line. The program management responsibility is then assigned to a division, generally following the predetermined Product Line responsibility. Exceptions can be made when warranted, based on such subjective and objective considerations as internal situations, external factors, geography, and the like. The division or organization assigned the program management responsibility becomes known as the "Prime" division or organization. It performs basically in the same manner within the company as the prime contractor does with the government.

All individual contracts, purchase orders, and sundry transactions related to a particular program are associated with and made the responsibility of the Prime division or organization. This company ground rule is compatible with the Department of Defense's Program Package Concept--each program includes all contracts and transactions bearing on the total program objectives.

Programming

One of the major functions of the program management organization is programming. Programming involves many facets. Basically, it has to do first with determining what, when, where, and how the various requirements are. Next, decisions concerning the appropriate actions
to be taken are made. The progress and the results are then watched on a continuous comparative basis.

It is important that there is early clarity and understanding concerning what is to be done. Prompt integration of schedules with appropriate actions assures proper interfacing and resources deployment. To facilitate communication and to document the pertinent determinations, program plans are created. Program plans may be made and expressed in a variety of formats, but they always should cover such essentials as the various organizational task responsibilities, funding, schedules, deliverables, special requirements, and the like. Program plans are also used to monitor requirements, progress, and status. Their implementation and use will be further discussed later in this study.
CHAPTER VI

CHARACTERISTICS OF PROGRAM MANAGEMENT

Organization and Objectives

The concept of program management is typified by certain characteristics in its organization and objectives. These can be summarized as:

1. The establishment of a Program Manager and a Program Organization for the accomplishment of a single specified program or purpose;
2. The existence within the parent company of the Program Management Organization as an individual entity to accomplish its designated purposes, but without its own individual administrative existence; and
3. Management planning systems and information flows that are realistic, foresighted, and prompt so as to allow immediate corrective actions, when needed, as well as to monitor progress and determine status.
Accomplishment of specified program or purpose

In Chapter III, under the discussion of reasons for program management, the first conclusion of the research study concerning management patterns of project managers is that

the primary management reason for project management organization is to achieve some measure of managerial unity, such as unity of communication, control, direction, and/or command.¹

The establishment of a distinctive organization for the accomplishment of a specified program or purpose provides the basic framework. To enhance this distinct operating entity, it is possible to have special identification badges, emblems, or pin-type miniature models of the product issued to the participating members. Program organization charts can be distributed, showing membership, assignments, and functions. Esprit de corps also can be generated in various other ways to give meaning and significance, as well as special status, to those fortunate employees enjoying program participation. Individual identification with successful programs, both past and current, can be made a matter of pride and recommendation on the records of the company as well as

¹Davis, Management Patterns of Research Project Managers, p. 9.
in the minds of all the employees. The program manager is thus provided with a very strong base from which to operate.

The distinctiveness of the organization and the specificity in purpose often make it necessary for the program manager to disregard existing levels and functions and superimpose a structure of his own on the existing organization. This is another conclusion resulting from the research study of management patterns of project managers. The program manager, as a point of synthesis for the program, must put together all the diverse activities that will be involved. These include research, engineering, test, production, finance, administration, and the like, to mention only a few activities. These activities also must be related in proper sequence, time-phased, and adequately manned with qualified personnel. Regardless of permanent organizational location or assignment, those persons whose abilities can contribute positively to a specific program or project can be requested for such assignment.

Personnel assignments to a program organization are, like the program itself, finite in duration. After the assignment or the program is completed, whichever occurs first, the personnel involved are available for reassignment. Reassignment may be to another program or

\[2\text{Ibid., p. 10.}\]
project or the return to the permanent "home" organization. Assimilation into the "home" group, especially after a very responsible assignment or an extended absence, is not without its own special problems. Settling back into lesser responsibilities or into a repetitive routine, after a very demanding and ever changing tour of duty elsewhere, may be welcome to some but distasteful to others.

Program managers have the responsibility for managing a higher proportion of professional personnel of a generally higher than average caliber than are found in a typical non-project type of organization. The obvious basis for selection of many of these personnel is particularly because of their caliber, ability, background, or experience. The demand for these qualifications usually exists in many other areas as well. Consequently, different management techniques must be used with these personnel than would be used in the more simple superior-subordinate relationships. Whereas more comfort and security may be thought to exist in the stable functional work areas, the work situation in a project is fluid and subject to cancellation. The project manager's functions of planning, organizing, directing, and controlling must therefore include more attention to motivation, persuasion, and human relations as compensating factors.
The organization that is assembled by the program manager, to be efficient and successful, must be designed to fit the situation and the tasks. Points of similarity with other programs or with existing operating procedures could and should be handled in the same manner. Points of difference, however, should be recognized and treated in a suitable manner. The criteria should be the optimum method for the proper accomplishment of the program objectives.

The question is sometimes raised as to how much time, attention, and effort should be devoted to one-time situations as compared with situations of a repetitive nature. On the surface it might appear that efficiency and economy would dictate that limitations be placed on a proportional basis. While the facts in a specific instance would govern, as a general rule the criterion is clear. The importance of each particular situation to the proper accomplishment of the program objectives, rather than repeatability of the situation, should be the determining factor.

**Individual entity to accomplish designated purposes**

The program management organization is finite in nature. Relatively speaking, it has no past and it has no future in the long-term sense. It has only a present, a near-future, a mission to accomplish, and the ability
and authority to adjust to appropriate size. These factors make the program management organization flexible in size and composition. It can expand or contract with relative ease. The ability to expand is limited by the ability of the parent company to supply the type of requirements, of the quality and the quantity specified, on a given schedule. The ability to contract is without such restrictions. The parent company must accept in a prompt manner the return of personnel and facilities even if in so doing problems are created for the parent company.

The flexible nature of the organization and of the requirements and schedules for the program may result at times in only a part-time need for various personnel and facilities. There may be a definite financial inability in the program to support all the personnel or the facilities between these periods of limited usage. Nevertheless, at the future dates when the requirements so warrant, the availability of the proper personnel and facilities is expected for the appropriate program use. Because of the transitory nature of the program itself, program management does not include personnel administration or similar types of administrative effort. This allows the program management to devote undivided attention specifically to program related efforts.
Systems and procedures are provided within a company to establish uniformity in operations and in responding to repetitive situations. In the area of program management, there is sufficient in common between all programs that some general program management systems and procedures can be prepared. There is, however, sufficient diversity in specific aspects that precludes systems and procedural coverage in certain areas. The result is a combination of both general and exception procedural coverage for a given program. The establishing of special authority/responsibility relationships is necessary when it comes to decision making since all facts about a program problem are not always known when it arises. The program manager must be empowered to make necessary decisions and to support appropriate actions as required.

Management planning systems and information flow

Management planning and information or data flows have always been important requisites of good management. These become especially important in a program operation that generally involves large sums of money and small quantities of costly products. Total overall planning becomes especially important when sequential phasing of operations is replaced by the concept of concurrency, or
the parallel phasing of operations. As stated in the AFSCM 375-3:

Under this concept the development and test of several parts of a system are conducted concurrently. . . . everything's going on at the same time. This may sound confusing, and it usually is, but with proper coordination, combined with an efficient integrating agent to fit the pieces together, it works out. . . . The concurrency concept allows us to field a system faster. 3

Crisis elimination should be an integral part of the management plan. A plan is really a blueprint for a series of things or actions that should be done at a particular time to accomplish an end. 4 The degree of detail is dependent upon the size of the project and the possible consequences of not including an item. 5 The planning should cover as much as it can of the handling of those events which can be expected to happen. This should leave as much time as is possible for the handling of those events which unexpectedly do happen.

3p. 4.


5 Ibid., p. 19.
Melvin Silverman, formerly Manager of Program Management, Controls Department, Kearfott Division, General Precision, Incorporated, describes the program plan as

one of the most formalized planning techniques since it is a published management document which describes program objectives, definitions, requirements, interfaces and schedules, and in addition answers specific customer requests. It is maintained throughout the life of the program as a base line but may have revisions if the direction of the program changes. . . . The plan may be a minimal one. . . . The only general requirements are that it show the answers to who, what, why, where, and how.

If the program is established in answer to a specific customer request, the plan may include descriptions of the program procedure and practices, management organization, resumes of principal personnel, and other information to satisfy the customer's stated requirements. In the aerospace industry a program plan might include many volumes because of the customer's detailed requests.6

As a general rule even if it is not required by your customer or your company management, it is wise to write a brief program plan before expending any great amount of company funds.7

6 Ibid., p. 35.

7 Ibid., p. 36.
The "Musts" of Successful Program Management

In Chapter I, under the discussion of the importance of this study, the statement is made that program or system management is basically a management tool. Other statements are made to the effect that when program management is required as a standard operating procedure, it becomes a contractual obligation requiring compliance and fulfillment. It is, therefore, imperative that the contractor be fully aware of the obligations and requirements to which he is agreeing. It would appear advantageous to learn whatever and whenever possible from the successes or failures of others who have experienced these same requirements.

The AFSCM 375-3 lists what it calls

a collection of good solid tips on SPO [System Program Office] management gleaned from our most successful system program directors:

a. Know every aspect of your program.

b. Don't try to fool people at high levels. Both technical and management competence exist there.

c. Know something about related systems in all services.

d. Be aggressive. Stick up for what you believe, but don't lose your sense of humor.

e. Don't spring surprises. Keep higher headquarters, the using command . . . informed.
f. Pass information topside as soon as possible, especially if it impacts schedule, cost, or performance.

g. Adjust your briefings to your audiences.

h. Know your contacts in higher headquarters and all other commands all the way through DOD [Department of Defense].

i. Recognize that the decision-making processes are becoming centralized. Get in the loop.

j. Distinguish between the important and the unimportant. Concentrate on the important.

Implicit in this is a sound knowledge of the processes through which the program must travel and recognition of the environment in which a program lives from beginning to end.8

Program Assets/Liabilities

A program has several very distinct and recognizable assets. It has a clear definition of authority and responsibility. It has certain goals and specific requirements regarding performance, time, and budgets. It has additional functional personnel assigned or the excess relieved as required. While it has no long-term future to which to look forward, it likewise has no necessity for making or implementing long range forecasts.

8Pp. 5-6.
While recognition of failure can be obvious and swift, achievements and success can be equally obvious and traceable to program rather than external activities.

Some factors can be either assets or liabilities, depending much upon the manner in which they are exercised. Control over the salaries and the tenure of program personnel by the program manager is an example. The ability of the program manager to reward superior work is limited to commendations to the personnel and recommendations to the functional managers. Monetary reviews and promotions are within the province of the administrative organization managers. Control over project funds, in the sense of commitments and expenditures, passes to the functional managers as soon as the project manager approves the proposed budgets. Getting cooperation from program personnel is a straightforward matter of achieving authority and recognizing human limitations.⁹

A major liability is the program management concept of "two-headed" control. Personnel generally report to two managers. Task responsibilities report to the program manager but the administrative duties remain with the functional manager. Melvin Silverman describes this as "two-headed management, the program (or fearless

---

⁹Program Manager's Guide to Survival, p. 70.
leader) manager and the functional (or spiritual leader) manager. 10

There is a very natural tendency for program personnel to view everything else in subordination to the program which is being worked. This might be admirable from the point of view of the program, but if this narrow attitude were to be applied by all programs, it would work to the detriment of the company as a whole. A parochial and blind-to-all-else outlook can also become misleading. The mistaken impression can be gotten that all other programs operate in an identical manner. Overlooking the shades of difference which make each program's uniqueness proper can lead to unnecessary misunderstandings.

The finite program length becomes a problem as the program draws to a conclusion. Interest and attention lag as the jockeying for the next assignment begins. There is more apparent excitement in the beginning of something new and unknown than in the completion of something old and familiar.

A point of constant interest is what happens to a program response. In preparing the response to be submitted for a program, a quotation is built up using the logical inputs from the responsible personnel who

10 Ibid., p. 69.
are to do the job. When the carefully prepared plan for
task completions and expenditures of funds is later
compared with the resulting contract, the question is
generally raised, why are the contracted funds not laid
out according to the quoted plan? As a former Manager of
Program Management, Melvin Silverman explains

there are several excellent reasons that
we shall explore. A quotation is very
rarely submitted to the customer with
no modification by your own company's
top management. The final price may
be affected by marketing estimates of
potential competition, by management
projections of future changes in company
overhead, or a decision to alter the
price to "buy into" a potentially
profitable program. Then during
negotiation with the customer the price
may be further altered by changes in
specifications, additions or deletions
to the tasks or simply by the
negotiations themselves.

The finally agreed-on contract price may
therefore vary considerably from the
original quotation. It is now necessary
more or less to repeat the original
estimating process and build a program
plan, but with one significant difference. 11

In preparing the pre-negotiations estimate, the requested
response could be considered as a tentative plan and cost
estimate that is hoped could be achieved. After the
definitizing process of contract negotiations, the
requirements and the agreed funding must be reviewed in

11 Ibid., p. 77.
the realistic sense that they are now specific obligations. It becomes necessary to plan and to estimate budgets for the new requirements in the manner in which they now actually will be performed. The new plan may vary to the extent that it bears little resemblance to the original negotiation proposal. While it may therefore appear that the pre-negotiations exercises, so laboriously and carefully assembled, are futile, they serve their purpose as a base line from which contract negotiations could begin. Experienced program personnel become accustomed to the iterative processes that precede each contract negotiation in the life of a program.
CHAPTER VII

ORGANIZATION AND ADMINISTRATION

OF PROGRAM MANAGEMENT

Planning and Organization

Just as people do, organizations have the ability to have a personality, character, and distinctiveness. In the automobile industry, for example, one of the Big Three companies has the reputation for being "engineering minded." One of its competitors is described as being "style conscious." The image that is projected by these characterizations is the reflection of the attitudes, the actions, and the general policies of the management of these companies.

In the field of program management, the attitudes, actions, and general policies of a company's top management likewise have a direct effect on its program management image and practices. Hesitation, mediocre responsibility assumption, misunderstandings, and poor performance reflect ambiguity, uncertainty, and lukewarm support from the upper levels of management. Only from a positive approach can a positive attitude emerge and be supported.
A positive approach is a company's belief, expressed in its policies and in its actions, that serving its customers' needs and maintaining integrity in meeting business commitments are a means for survival in a competitive environment. Accomplishing work in an orderly manner, meeting schedules set by both the customer and the company, and conforming to budgetary limitations are also expressions of a positive approach. Providing management with dependable visibility and meaningful controls, so as to facilitate the exercise of authority and fulfillment of responsibility by the operating managers, are implementations of this approach.

A positive attitude enables a company to better fulfill its contractual obligations to its customers. As stated in Chapter V, Requests for Proposals from Department of Defense Agencies state clearly the Government's requirements for system/project management. A responding contractor must include in his reply his planned participant program management structure and organization. After acceptance of this requirement, a company's program management function results from the attitude, organization, and planning for it.

Types of Organization

The first major conclusion of the research study of Management Patterns of Research Project Managers is
"that there are many types of project management organization."\(^1\) Each approach to organizing for project management has its own advantages, disadvantages, management pattern, job requirements, and particular level of management sophistication.

From the study, there appear to be four major types of activities that are sometimes designated "project management."\(^2\) One, the project expediter type, does not perform the usual management functions of planning, organizing, staffing, directing, or controlling. The main function here is to facilitate the work as necessary to assure that schedules are met and that management in general is informed on the status of the project. The reporting may be to either a low or a high level manager.

A second type, the project coordinator, has independent authority to act but does not direct the work of others. Leadership is exercised through procedural decisions, personal actions, and control of the budgets. The coordination may cover only certain aspects of the project or the entire project.

The project confederation manager is a manager in the sense of performing the normal functions of a manager--

\(^1\)Davis, p. 5.

\(^2\)Davis, Management Patterns of Research Project Managers, pp. 5-8.
planning, organizing, directing, and controlling the work of others. Personnel assigned to the project remain administratively and physically in their permanent departments. This type of organization is described in Chapter VI as the "two-headed" control concept.

The project general manager achieves the objective of unity of command. Personnel are temporarily withdrawn from their departments and are wholly assigned to the project under the project manager. The project is in many respects considered to be a separate entity, much like a branch or a division, in its own right, for its duration.

The brief descriptions of these four types of activities reflect points along a line rather than distinct hard and fast real-life situations. In actual practice the types would tend to merge and blend into numerous variations designed to fit specific situations. Within a given company, for example, each program could have an organization different in small or in major respects from all other programs within that same company. Even within the same program the various branches could design their own unique organizations if by so doing they would be better able to perform their assigned tasks.
Organization Rights and Responsibilities

The term "administration" sometimes is used as a synonym for "management" to mean "directing operations within the framework of policy laid down by higher managers or set by predecessors."\(^3\)

Top management's attitude towards program administration can be made known in a variety of ways. One method is in a statement of company policy. The exact style of expression or exact words used are not as important as the intent conveyed. Clear, unequivocal statements tend to produce clear, unequivocal meanings. It is not always possible, or practical, to cover in a single brief document the entire subject and all its implications. How it is said, or not said, in a particular policy statement depends upon the contents of other policies and procedures in effect in that company.

An expression of a firm belief and a positive attitude can be seen in this statement of a Company Policy:

1. **Program Plans**

Master scheduling and programming are utilized to provide the techniques to determine and establish the sequence of, the time of, and the responsibility for fulfillment of contractual obligations.

---

and deliveries in accordance with schedules.

All company sponsored work or work performed under a contract must be accomplished under a program plan.

Program plans primarily show the total scope of work to be performed, and the schedule for accomplishment of work. They are aligned with the related funds schedules required. Program plans designate the organizations responsible for performing the work and include manpower, facilities, and materiel requirements.

3. Program Administration

The administration of programming is a function of the major operating organizations. Program plans, related funds, schedules, program summaries, program status, and effectiveness of resource information are developed and maintained in an accurate and up-to-date condition. This information is summarized to meet requirements of both operating and corporate management. Timely and periodic evaluations of the extent and effectiveness of the programming effort within his organization is made by each operating manager.

Group executives and division managers are responsible for the implementation of company programming policies and for the accomplishment of all programs within their respective groups and divisions. This includes the authorization of funds, through the cognizant controller in accordance with approved program plans and related funds schedules. Group executives and division
managers furnish corporate management with information concerning plans and programs in the format and to the extent required.4

The relationships with and support for program management by top management can thus be made part of the organization character and system. With such backing, the typical program manager is endowed with certain rights along with certain responsibilities. One of these rights is to establish a suitable organization within the framework of the parent company. Another is the ability to augment this organization structure as necessary, should program expansions occur. The most important right occurs when the program manager "manages a prime program, acting with the delegated authority of the division manager."5

The program manager is then able to commit all necessary division resources, and request other company resources if required, to accomplish the program.

Typical endowed responsibilities include:

1. Publication and maintenance of program organization charts.


2. Representing the Company as the primary contact in dealing with the customer and with related contractors on program matters.

3. Surveillance over and participation in contract negotiations with the customer to assure that program objectives can be met within the terms of the resulting contracts. This responsibility subsequently extends to internal negotiations with the participating organizations to assure compliance with the contractual commitments of the company.

4. Effective use of company approved planning and control systems to achieve the greatest possible management visibility and control on all aspects of program performance.

5. Development and maintenance of program plans covering technical, financial, and status aspects of the program.

6. Allocation of funds necessary for performance of approved work and such reallocations as necessary due to changing conditions.

7. Initiating corrective action when actual performance deviates or is predicted to deviate from established program plans.

8. Establishment, coordination, and execution of those functions required or permitted for the program.
9. Providing participating organizations the information needed concerning contractual and program requirements.

10. Regular information on program status to the division manager and other interested areas and recommendations for necessary management actions for the expeditious conduct of the program.  

Program Management/Top Management Interface

When a program manager acts with the delegated authority of a division or other top level manager, he acts in the light of and in the right of that manager. In essence, he is an agent--and a very responsible agent--for top management. His thoughts and his actions must be representative and his conduct such that the confidence of those he represents remains full and without question at all times. Much of the time a program manager operates in an environment and with situations calling for his best judgment or for his weighty decisions. The various factors that originally indicated his capability for the job presumably are such that he is able to do the job in the manner expected. However, since ultimately it is their responsibility, it is necessary for top management

---

6 Ibid., pp. 1-4, paraphrasing of selected statements contained therein.
to periodically review and evaluate the program manager's performance.

The program manager is in the unique position to know more about the program than any other individual. His position is the point through which the significant incoming and outgoing activities funnel. It is the program manager's obligation, then, to keep top management informed on a qualitative, significant basis. Bad news as well as good news is reported to prevent surprises or embarrassment. Soliciting support when required is facilitated when a continuing awareness of the program, its progress, and its problems exists. The company's interests are also protected through the review process from the possible irrational or improper decisions or actions of a lower level manager.

There are various methods for informing and keeping in touch with a program. One of the most common methods is reports, both oral and written. Reports can cover operations—what has been done—or status—what the situation is now. Forecasts are another type of report, directed toward the future. Reports can be distributed, if written, or can be presented at meetings. Meetings vary in size, depending upon their purpose. There are information disseminating meetings, problem definition or solving meetings, and planning meetings, to name a few. Visual aids, such as charts, graphs, models, photographs,
drawings, and the like are used with reports, at meetings, or independently, as a means of communication and for keeping in touch with a program.

The interface between top management and program management must work in both directions. There should be a means by which top management recognizes the efforts, contributions, and achievements of individuals and groups working on a program. This means should also, when warranted, enable a suitable acknowledgment to be made of this recognition.
CHAPTER VII

STAFFING PROGRAM MANAGEMENT

In Chapter V the purposes of an Industrial Program Office are discussed. In the discussion, the point is brought out that certain items are required to be contained in a contractor's response to the Government's Request for Proposal. One of these items is:

17. Participant commitments for managing the project including:

(a) Planned participant project-management structure and organization.

(b) Key project management and technical personnel by name and experience, together with statements of responsibility and authority for Engineering Development.¹

The effect is to force the contractor to perform a degree of advance planning and to make certain definite commitments.

Consequently, the contractor's proposal package contains a section in which the program's principal supervision and staff are named. Brief resumes emphasizing background, training, experience, and other

¹Systems Development Directive 3200.9, p. 3.
qualifications of specific individuals, and their intended assignment or availability on a part-time or full time basis for this program, are included. The same type of information is included for selected major subcontractors.

This section of the proposal package, if so prepared, can be used to the advantage of the contractor as a type of sales brochure. It can serve as a dignified presentation of the abilities, facilities, and endeavor that will be devoted to accomplishing this program. It can contain a description of the size, variety, and caliber of the various trades staffs and specialized technicians available within or to the company. Brief descriptions of the approach, procedures, familiarity, and experience to cope with known or new technical requirements broaden the customer's understanding of the contractor in the technical areas. Descriptions of the various types of engineering, production, test, and data processing facilities can also be included. Any other special or general type of pertinent information can likewise be brought to the attention of the customer.

The Program Manager

The title, "Program Manager," is a rather versatile term. Its meaning can be either defined or described, depending upon the sense in which it is used. The term can apply to a concept, a position, or a job description.
In Chapter I it is pointed out that "system" is synonymous with "program." In Chapter III it is discussed that in earlier publications the distinction between "program" and "project" is not always clearly observed and in some instances the terms are used interchangeably.

In the Department of Defense Directive on System/Project Management, the concept of a System/Project Manager is defined as

a designated individual assigned the responsibility and delegated the authority for the centralized management of a particular system/project.²

In the "Program/Project Management" Group Policy statement of a large company, the position of Program Manager is defined as one who

manages a prime program, acting with the delegated authority of the division manager. He is responsible for interaction with the customer and for financial, schedule and technical performance on his assigned program.³

In Melvin Silverman's The Technical Program Manager's Guide to Survival, the job description is uniquely expressed in the Preface. Mr. Silverman states:

²5010.14, p. 2.
In fields of work other than industry you must be a generalist before you can specialize. . . . It does not work quite that way in industry. In industry you are first a specialist and then a generalist. The transition in many instances is unnerving to the new manager even if he is entering an environment and an organization that existed before he came along. The transition can be even more unsettling if the new manager has the title of program manager, for he must then start off as if he were an independent entrepreneur. He has to plan what to do and when to do it; to recruit his own team, quote the job, design it, build it, deliver it. As an example, there is nobody around to explain what the differences are between the various sizes of the standard product, for there is no standard product—only specific customer need to be satisfied.

Therefore the first item of business for the new manager is survival (defined here as the ability to make decisions that will result in eventual profits and continued job tenure). To survive, the specialist-turned-manager must become familiar with all of his program disciplines, their interaction and their control. He must be able to communicate with lawyers, accountants, machinists, quality specialists, engineers, assemblers, and a host of others, some higher, some lower, and some on the same corporate level as he. He must be able to recognize errors and cope with the necessary corrections to minimize them. This all must be done with very few corporate guidelines, for the program is as new to the company as the manager is to the program. It is not easy, but it has been done.4

A long list could be assembled of the necessary or desirable personal attributes of a program manager.

---

4P. v.
Exactly how many personal attributes, which ones especially, and to what degree are difficult to say. Personal attributes alone do not assure success but they do increase the likelihood.

It has been stated that the ability to make the transition from specialist to generalist is a prime necessity. In so doing it is necessary to suppress the familiar technical knowledge and abilities and the desire to use them and to replace them with a lot of not-too-familiar and new knowledge. The ability to do is replaced by the requirement to manage. This involves the ability to motivate people and to delegate responsibilities to them. The art of communication and the ability to understand come into full play. Self-reliance and the feeling of success come from experience and practical business know-how. The abilities to recognize problems and to work to their solutions are important. Versatility, responsibility, and honesty are likewise. Program authority must be assumed, maintained, and demonstrated. Good health is required to stand the pace and the rigors. Often overlooked is salesmanship—the technique of selling one's program, ideas, or self.

As for functions, a program manager is a digester of huge quantities of data. He must make decisions, often based on incomplete data or facts, that must be right practically all the time since there is seldom much room
or time for errors. He must also maintain control of all situations at all times.

Professor Keith Davis is the author of an informative research study on what is perceived to be the role of a program manager. "Role" is used here in the sense of being "the pattern of values and actions expected of a person in a certain position." In this study the views of the program manager are compared with the views of his superiors and of his subordinates on seven different dimensions. The overall result is that "all three groups tested show a high degree of similarity in role perceptions, as expressed by the alternative a project manager would choose (or emphasize) in a problem situation."6

In the occupational orientation dimension

project managers recognize both the internal and external aspects of their job and attempt to serve both in a balanced way. As a scientist or technician, they look to their profession for recognition, but they also accept the norms and loyalties required by their specific company in accomplishing their work.7

5Davis, Role Perceptions of Program Managers, p. 13.

6Ibid.

7Ibid., p. 16.
In the **organizational orientation** dimension

... this research shows that two-thirds of respondents see primarily a downward orientation toward the needs and performance of their work group.

To perform their role, project managers must look toward the creative talents of their subordinate work group more than to management.⁸

With regard to **functional orientation**, "all three groups agree that the program manager is more managerial than technical in his orientation."⁹

Perceptions on **leadership style** would be expected to differ because higher managers see it from above while subordinates experience it from below. In the study program managers are perceived as slightly more autocratic... than participative...

These data further confirm the close "colleague" relationships of program managers with their group. In scientific work there is a tendency to defer formal authority whenever possible and operate with a colleague authority which "emphasizes a relationship of association, alliance and working together, and, at the same time, accepts whatever inequality in status may be present."

Considering all the evidence discussed we may conclude that a participative, colleague

---

⁸Ibid., pp. 16-19.

⁹Ibid., p. 19.
relationship is quite significant in program management because of the type of work and people involved. 10

In the supervisory orientation dimension research confirms that the more effective supervisors have a higher employee orientation than production orientation. Much of the differences in perceptions comes from responses. 11 concerning schedule deadlines.

Subordinates are not perceiving the program manager in the way he perceives himself on this dimension. 11

For the functional role of planning, organizing, directing, and controlling, there is substantial agreement in perception between the three groups. They also perceive the program manager's primary functional roles are first planning, then controlling. 12

In the operational role dimension the two managerial levels give slightly higher emphasis to decision-making, but subordinates give slightly more emphasis to communication. Apparently all three groups see both activities as essential to the program manager's job. 13

10 Ibid., p. 20.
11 Ibid., pp. 20-21.
12 Ibid., pp. 21-22.
13 Ibid., p. 22.
For the seven dimensions

in summary...there is remarkably consistent agreement among all three levels in their perception of the program manager's role.\textsuperscript{14}

The Responsible Activity

The "Responsible Activity," sometimes called the "Responsible Engineering Activity" or the "Responsible Organization," is the organizational unit within a company which has been assigned the responsibility for the accomplishment of a specific task or tasks on a program or project. The assignment is generally based upon either the inherent capability or the operating charter given by management to each organization as to its purposes and functions within the company. These purposes and functions are usually implemented with the resources of personnel, equipment, facilities, and funds necessary to realistically operate within and meet the requirements of this charter.

The point has been brought out in Chapter V that one effect of the government's program management procedures is to force a contractor to perform and commit himself to a degree of advance planning. Advance planning

\textsuperscript{14}\textit{Ibid.}
is a necessary part of the procedure in preparing a response to a Request for Proposal. The proposed Work Breakdown Structure in the Request shows the various elements and their relationships that are to be considered. Each entry on a Work Breakdown Structure is an element and may be for either an identifiable product, a set of data, a collection of services, a function, or some other work task.\textsuperscript{15} As stated in the \textit{Proposed MIL-STD-881}:

\begin{quote}
The lowest level of the Contract WBS for project planning and control shall be that necessary to reach manageable units of functional tasks and shall reflect the way the work is actually being performed by the contractor or government agency.\textsuperscript{16}
\end{quote}

The higher level elements, or major tasks, are therefore subdivided on the proposed Work Breakdown Structure or by the company program management into the applicable lower level component elements or tasks. For example, major Task: Black Box "A" may be subdivided into Task: Design; Task: Fabrication; Task: Test (or Proof of Design); and, Task: Evaluation. Each task is considered to be a portion of work capable of clear definition, specification, or description. The task contents, specifications, schedules, milestones, start

\textsuperscript{15}\textit{Proposed MIL-STD-881}, p. 3.

\textsuperscript{16}p. 7.
dates, completion dates, interfacings, funding, and other pertinent data must be understood or should be clarified in the course of the response preparation.

The assignment of each task to a single organizational unit within the company is on a responsibility basis. "Responsibility" is considered to be the "obligation exacted from the subordinate for the accomplishment of these duties."\(^\text{17}\) "Responsibility," the obligation for accomplishment, is thus differentiated from "performance," which is the actual doing the process or meeting the requirement.

It is possible that a portion of a responsible task could not be performed within or by the responsible organization. In the example of Task: Black Box "A," the fabrication effort might not be within the capability of the organization responsible for the total Black Box "A" Task. A delegation, on a performance basis, to another organization capable of this effort would therefore be made. The delegation could be within or outside the company. If performed outside the company, it would be considered as a subcontracted or a purchased function. Responsibility for the ultimate successful completion of the top Black Box "A" Task would remain with the organization originally assigned the total Black Box "A" Task.

responsibility. This would include responsibility for the fabrication effort and for any other subdelegated efforts performed by other organizations.

Tasks, which are determined on a responsibility basis for project planning and control purposes, should be differentiated from "work packages." Work packages are determined on a performance basis as a delineation of work required to complete a particular job. The significant characteristics of a work package are:

(1) It represents units of work at levels where performance is managed.

(4) It is such that responsibility for performing the work is assignable to a single organizational element.

(5) Its size and duration is established to reflect the foregoing, the type of work involved, and the necessity of using relatively short spans of time to minimize the requirements to use estimates, arbitrary formulae or other less objective means of evaluating status of work in process.18


19Ibid.
Within the Responsible Activity, a qualified individual is designated to represent and act for the organization regarding each responsible task assigned to it. A responsible individual is likewise designated for each sub-delegated task, portion of a task, and work package received. In this manner a continuous chain of specific responsibility exists at all times, through all organizations, for each program or project. The normal management and supervisory levels in all organizations continue to function in their usual manner. In addition, these levels oversee and are secondarily responsible that the primary designated personnel perform and fulfill their assigned program or project responsibilities.

In summation, the Responsible Activity is the area of technical capabilities, personnel, and facilities. It is a functional organization, responsible to a program or project organization for specific assigned tasks. It is usually the area of performance. It assists in preparing responses to proposals because it is the general area where the work is planned, performed, evaluated, and supervised. It provides the qualified personnel when and as required and designates particularly qualified specific individuals to represent and act for it. It reports accomplishments, problems, status, and forecasts, as requested. It provides the efforts and the perseverance
CHAPTER IX

SOME PROGRAM MANAGEMENT PROBLEM AREAS

The field of program management is still relatively new. It is a dynamic area of endeavor, expanding to cover more and greater portions of the work being performed by industry for the government. It is in existence as the result of a need, to serve as a "tool," to fulfill certain purposes. It has the approval and support of government regulations to make it applicable, acceptable, and effective. Nevertheless, it is still possible for program management to suffer some of the normal pains and problems and any developing "instant theory."

Capable Program Managers

From previous discussions, it is obvious that the most important role is played by the Program Manager. The effectiveness and the ability with which a successful Program Manager performs are due in large part to the special attributes, innate talents, experience, and training which he possesses. Just as important as having the ability to perform, however, is having the opportunity to perform. It is quite possible that there are available within each organization many capable persons who will
never have the opportunity to perform in the capacity of a Program Manager. Without the realistic test of opportunity and performance, ability as a Program Manager is difficult to assess.

Finding capable Program Managers is a big problem, shared by both industry and the government. Dr. Simon Ramo, Vice Chairman of the Board of TRW Inc. (formerly known as Thompson Ramo Wooldridge), cofounder and President of Bunker-Ramo Corporation, and a past director of United States Air Force programs, states:

In the defense, space, and other industries, government programs have grown tremendously in complexity, size, cost, newness, interactions, and technological content. This change has made it necessary to shift more of the responsibility for the management of new programs from industry to government. It ought to be clear to all, including the most stubborn of us in industry, that the government is now faced with the need for manning and operating a kind of program management which, to a very considerable degree was once properly placed in industry.  

Dr. Ramo also believes

it is now firmly established that the government must manage programs in greater

---

detail. The government has indeed taken on the responsibility for so doing, and it will continue to operate in such a pattern for some years to come.

The biggest and toughest program management jobs are now clearly in the government. The government program manager has to direct the match between the requirements of the government and what science, technology, industrial know-how, and capacity make possible.²

Dr. Ramo does not believe that only certain kinds of professional training, backgrounds, or experience make a good manager. He believes the basic combination of inherent talents and capabilities can produce good managers if the persons possessing this combination are found early enough to provide them with the necessary training and apprenticeship so that they can be developed. This suggests that the government must arrange for its program managers to be career men in management.³

The same situation that faces the government faces industry in its quest for capable, qualified Program Managers. The requirements call for a combination of administrative and technical education and experience. The experience and background that accrue from working on progressively larger and larger programs are difficult to duplicate in classrooms or in training sessions other

²Ibid., p. 8.
³Ibid., p. 10.
than in real life situations. In short, successful program management results from successful Program Man-
agers. Successful Program Managers are the product of the person, the development processes, and personal experience.

**Capable Program Administrators**

The administrative and financial functions of the program management organization are generally headed by the Program or Project Administrator. The combinations of talents and abilities which are available in this area have a direct and definite effect upon the Program Manager's manner of operation. It is in this area that information and visibility concerning the requirements and the utilization of resources, materials, and manpower, their related costs, and their effect upon schedules are collected and summarized. If properly analyzed and translated into meaningful reports for management action, this data is valuable and this function is vital in the conservation and best usage of the Program Manager's limited available time.

The ability to recognize and to identify actual or potential problem areas at an early stage is important. Investigation into probable causes and recommendations as to corrective actions are essential functions. The
analysis of trends and the projection of probable effects add significance to routine status reporting.

Program Administrators must have the ability to visualize and to plan the administrative networks and paperwork systems so that the desired and necessary bits of data are properly and progressively created along the way. While the degree of technical background can vary, a minimum amount of technical recognition, which can be developed, is necessary for understanding and for communication. Objectivity, judgment, and an analytical nature are desirable personal qualities.

The same problem that concerns Program Managers concerns Program Administrators. This is the problem of recognizing and developing an adequate supply of capable, trained, and experienced personnel for both government and industry.

**Capable Responsible Activities**

The Responsible Activity is the area of technical capability, personnel, and facilities. It is the functional organization to which is assigned the responsibility to perform the technical task described in the Statement of Work document.

In addition to the technical competence for functional performance, this area also possesses an administrative structure. The administrative structure
assists in preparing the responses to proposals and in planning the work assigned to the area. The requirements for and the utilization of facilities, materials, and manpower are supervised by this administrative function. Technical, progress, status, and problem reports are prepared as scheduled or as necessary. Likewise, revisions to plans and programs are made when required or when directed.

The technical areas, being the areas of performance, are the areas where the sense of cost-consciousness is most effective. The program management and the administrative functions can preach cost control and cost awareness but only at the points where the costs are generated at their lowest levels can these be realized. This necessitates careful attention to the preparation and review of all statements of work generated and issued. Likewise, all statements of work received and accepted must be carefully studied. Mainly by negotiating meaningful and realistic statements of work, for both internal and external use, can optimum results be reasonably anticipated. Only from the genuine acceptance of a full sense of responsibility to perform to the technical requirements, in accordance with the prescribed schedules, within the established cost limitations, is fulfillment of the program management objectives made possible.
Communication

Communication is not considered to be one of the prime management functions in the same sense that planning, organizing, staffing, directing; and controlling are. Nevertheless, communication is an activity that must be recognized and its importance emphasized.

In Chapter III, in the discussion on reasons for program management, certain of the conclusions are given from the study made by Professor Keith Davis on Management Patterns of Research Project Managers. The fourth conclusion is that a Project Manager reaches others to explain plans and to accomplish control only through the activity of communication. The conclusion further states that face-to-face communication is the principle communication method by which the Project Manager accomplishes his management job. Professor Davis states that this conclusion agrees with published studies of other types of managers. 4

In the Role Perceptions of Program Managers study, published in January, 1965, Professor Davis states that this later data further confirms the conclusion reached in his earlier research regarding the importance of face-to-face communication. 5

4P. 14.

5P. 23.
The same degree of importance of communication applies to all levels of personnel, not just to Program Managers. It applies equally well to any form of communication, whether oral or written, given or received. It applies to all types of situations where there is, or can be, a communication interaction or a need for understanding. It is essential that what is meant and what is said are clearly understood.

Management Support Versus Interference

In the discussion in Chapter VII on the program management/top management interface, it is stated that the Program Manager is an agent, and a very responsible agent, for top management. It is also stated that since it is ultimately top management's responsibility, it is necessary for top management to periodically review and evaluate the Program Manager's performance. In theory, this assures support when needed and protects the company's interests from possible irrational or improper decisions or actions by a lower level manager.

While Dr. Ramo, in his article on "Management of Government Programs," is expressing himself mainly from the governmental rather than the industrial point of view, much of what he says applies equally to both. Dr. Ramo states:
The rule today is that, whether the program managers are nearly perfect or far from it, on the average they do not have substantial, well-delegated, clearly defined responsibilities; nor do they have authority commensurate with exercising the responsibilities even when they appear to have it. A typical instance of program management in the government involves a dozen or more individuals or agencies, each sharing some of the responsibility and some of the authority.

It is in the nature of government, in the nature of the complexity of the administrative, technological, and operational factors related to weapons systems and other large projects, that full delegation and concentration of authority and responsibility in one program manager are virtually impossible.

But actually the program manager is often only a symbol, distinguished by the title. Numerous other parallel operators act not only as consultants but as judges, redirectors, delayers, debaters, investigators, coordinators, and vetoers. They are usually quite capable of actions which are not always known to the program manager in time for him to put forth his best effort to maintain a controlled program.

Diffused authority and responsibility mean lack of program control.6

As a rule, companies generally establish a system of policies, practices, systems, and procedures to serve as guides and directives for the various activities and situations they encounter from day to day. The intent and the finesse that go into the design and the preparation of the segments and the system depend for their fulfillment upon the manner and the sincerity with which

---

6 P. 7.
the various components of the system are applied and enforced. In their application, directives can be selectively designed around situations or around personalities. They can be declared applicable on a continuing basis or be limited to single or special instances. Directives can be permissive or restrictive in nature, expressed in either positive or negative statements. They can tend to centralize or decentralize the application of their subject matter. They can be silent on, or provide for, the circumstances, both foreseen and unforeseen, that make necessary or justify exception actions.

Since management support can be, and is, expressed in a variety of ways, care must be exercised constantly to assure that the distinction between management support and management interference is respected.

Management Information System

A Management Information System is a sophisticated method of gathering and processing various types of related, associated, and incidental data and reporting them in such a timely and meaningful manner that the results are useful end products. Caution and restraint must be exercised to prevent the proliferation of a multitude of reports and details that hamper rather than
help. The functions of management are best served by significance rather than by volume.

Reasonable arguments can usually be presented to support the existence of most types of reports and the generation of new ones. For most purposes, a few significant reports can usually serve the day-to-day requirements of each operational area. A reasonably correct approximation on a report now is generally a more useful guide to an action or a decision required now than is a more accurate figure at some later time. The significance of the data is often more important than the intrinsic data itself. The most useful reports are generally those that provide current data and pertinent facts on the principle of exception in a short, quick circuit.

The information the program management personnel find useful can be described here only in general terms. It consists of the various types of technical, financial, schedule, and status data, all of which are important on both an individual and an interacting basis. The budgets, on both a "responsibility" and a "performance" basis, expressed in terms of dollars and manpower requirements, are the essential backbone of every program, project, task, and work package. The performance figures which are compared to these budgets are called the "actuals." Both the budgets and the actuals must be measured and expressed in similar terms. The schedules of the
required technical performance, deliveries, milestones, and similar events are essentially the "technical budgets" against which the actual performance and accomplishments are compared. An appraisal of the current or potential problems and delays and the current status gives rise to projections of the cost-to-complete, and the cost-at-completion, of the various work packages, tasks, projects, and total program.

The experiences of the Program Managers and the Program Administrators on other programs are useful as guides to the contents and types of reports and data required for a new program. The organization of each specific company, its general system of procedures, operations, and data collection and processing systems impose the limitations on the types of reports that can be made and the deviations that can be allowed.
CHAPTER X
IMPROVEMENTS IN PROGRAM MANAGEMENT.

A review of this study of the field of program management indicates that there are several areas where improvements or continuing developments can be recommended. Several of these areas are selected for discussion.

**Determination of Principles**

One of the purposes of this study is the determination of the philosophies, policies, or principles involved in industrial program management. This study finds that the philosophies of program management are embodied, for the most part, in the various Government Agency publications and are generally included as attachments or references in applicable contractual agreements. As for policies, the general attitude of the upper levels of industrial management is to direct that these contractual obligations be honored and be given the agreed compliance. Consequently, it is mainly in the area of the daily operations and procedures that the principles governing successful program management are incorporated.
The term, "principle," is used here in a particular sense, with a particular meaning. Webster's Third New International Dictionary, Unabridged defines "principle" in many ways. One definition is that a "principle" is a general or fundamental truth, a comprehensive and fundamental law, doctrine, or assumption on which others are based or from which others are derived. Another definition states that "principle" applies to any generalization that provides a basis for reasoning or a guide for conduct or procedure. Examples of the usage of this latter definition would be in "the principle of free speech," or "the principle of freedom of the seas." It is in the sense of this latter definition that "principle" is used with regard to this discussion of program management and its principles.

Having defined principles as generalizations used as a basis for reasoning or as a guide for conduct or procedures, the problem now becomes the determination of what, if any, are these generalizations. This is the subject matter of the next Chapter.

**Dynamic of Static**

In the **Statement of the Problem** in Chapter I, Professor Keith Davis is quoted to the effect that program management is the outgrowth of government needs for a method, with a practical application rather than
a theoretical formulation, to fit a type of situation. In nature, it is "instant" rather than evolutionary. As such, program management is considered to be a tool rather than a philosophy. It follows, therefore, that it is, or should be, measured and considered by its effectiveness in its application rather than by its conformance to a school of thought.

Of necessity, program management creates a specific methodology in each application and with each expansion in its use. Situations requiring new decisions and new types of actions are generally judged and acted upon on their own merits, in relation to the total system, but at the local levels within the local rules. There is no supreme central authority or binding point of reference that can establish, direct, or require that a given effect always follows each given cause.

The situation, however, is not out of control. Furthermore, there is recognition that program management as a whole is many dynamic, flexible systems rather than a single, static, set procedure. The Department of Defense's Cost/Schedule Control Systems Criteria states:

Any system used by the contractor in planning and controlling the performance of the contract shall meet the criteria set forth. ... Information which is required by the Department of Defense must be produced from the contractor's system. ... Nothing within will be
construed as requiring the use of any single system, or specified method of management control or evaluation of performance. The contractor's internal systems need not be changed, provided they satisfy these criteria.\footnote{1}

An "Annex" is a formal detailed description of tasks to be performed by a contractor for an agency of the government.\footnote{2} The "Annex on Cost/Schedule Planning and Control System," which is made a part of applicable Air Force procurement contracts, states:

It is recognized that no single method, system, or technique will satisfy all company or Air Force managers' management requirements. A detailed universally applied method would be costly and cumbersome in some circumstances. The criteria stated in this annex are the bases upon which successful program control methods have been developed and are operating.\footnote{3}

The conclusion that program management is a developing, dynamic technique that must be judged by criteria rather than by specific rules of conformance is supported by these official statements.

\footnote{1}P. 2.

\footnote{2}AFSCM 70-5, p. 79.

\footnote{3}Ibid., p. 115.
Methodology

In the previous paragraphs, some mention has been made of the methodology of program management. It should be obvious that a management system that is designed to give visibility and control over a wide range of financial and technical aspects of complicated types of research, development, and procurement contracts, involving costly and complex products, must be detailed, complex, and comprehensive. The suggestion by Doctor Simon Ramo that the government must arrange for its Program Managers to be career men in management is some indication of the size and complexity of the task.4

Granted the size and the complexity of the task, the real problems are how and from whom are these methodologies to be learned. Where is the teaching to be done, where are the texts that are to be used, who are the authorities to be quoted, and who pays for the costs of this training--these are the real problems. Just as the growth in the use of computers creates an increasing need for personnel trained in all the many aspects of the computer complex, so the growth in the area of program management creates a similar need for its own specifically trained personnel. Both government and industrial publications tend to present points of view particularly

slanted to the positions and the roles each must play in the system. It is to be expected that differences in opinion or in interpretation could therefore arise on minor or major points.

The need exists, and will continue to grow with the expanded use of program management techniques, for increasing numbers of personnel trained in programs that are sponsored by government agencies, industry, and educational institutions.

**New Thinking and Doing**

The new and developing field of program management does not require that any radical break be made with the principles, practices, and experiences of former teachings and fields of management techniques. It does require, however, that a new way of thinking and doing be learned in addition to, rather than instead of, the thinking and doing of the past.

The new way of thinking and doing recognizes that the management sciences must keep pace with the technological sciences which they serve. Innovation per se is not to be encouraged, but innovation designed to serve a purpose, even when a radical departure from hallowed tradition is involved, is the trend of the future. Organization structures are tending to take on new constructions, relationships, and transitory natures. In
some respects, these may appear to be new features. In others, these may be regarded merely as logical developments or growth. Authority and responsibility relationships may likewise appear to be changed. In some instances, the changes are absolute departures from the past. In others, the changes may be in degree of emphasis. In each instance, the change and the amount of change are basically in comparison to the type of previously existing situation. In those industries and companies where changes of this new nature have been gradually evolving, the future transition will be a gradual maturity. Those industries and companies which have not agreed with or kept pace with the development of the techniques of the program management type, and later find themselves in the need of these developments, may experience substantial changes.

The new way of thinking and doing is also creating a vocabulary and terminology peculiar to its needs. A "direct labor hour or dollar" that is directly chargeable to a contract is not necessarily the same as the "direct labor hour or dollar" traditionally considered to be a "direct" cost in accounting theory. As Professor Robert N. Anthony of the Harvard Graduate School of Business Administration says in his text, Management Accounting,

the most common source of confusion is the word "cost."...there are historical
costs, standard costs, variable costs, differential costs, estimated costs, and full costs; each is a different concept, and each is relevant to a certain kind of problem.\(^5\)

A major point that must be kept in mind is that in each instance when the concept of program management is being followed as the result of a specific contractual agreement, only the specific terms and references of that contractual agreement bind and govern. Consequently, it is necessary that the terms and language of the contractual document and all its references be fully understood. Compliance is as much an item to be delivered to the customer as is any other tangible or intangible item.

Long range planning by a company or an industry should take into consideration the tone and the trend of the times. Whereas the Department of Defense so clearly states its objectives in a published Instruction, industry would be well advised to take note of this Objective:

DoD contractors should be continuously alert to advances being developed in management control systems to improve their contract performance, and to serve DoD and their best interests. It is an objective of this Instruction to bring to the attention of and to

\(^5\) P. 5.
encourage DoD contractors to accept and install management control systems and procedures which are most effective in meeting their requirements. \(^6\)

CHAPTER XI

SOME PRINCIPLES OF INDUSTRIAL
PROGRAM MANAGEMENT

In the preceding Chapter, principles, as used in this study, are defined as generalizations used as a basis for reasoning or as a guide for conduct or procedures. A review of this study indicates certain generalizations, used in the sense defined above, that can be proposed as principles of program management. These proposed principles are arbitrarily grouped into categories for presentation in summary form. Each subject discussed is taken from the main body of this study.

The System/Program Concept

The "Program Package Concept" has enabled the Department of Defense to "mission-orient" this nation's defense requirements into a package consisting of nine basic programs. Each basic program contains various "program elements" which are dollar-costed and time-phased functionally. Program elements usually are individual systems and are generally called "programs."

The "weapon system concept" has one contractor, commonly called the "prime contractor," assigned the role
of weapon system manager and made responsible for the proper overall development of that particular weapon system or program.

Some programs are by definition and nature system programs. There are other programs which are not system programs per se but are of such magnitude and complexity that they also require system management.

Conceiving the ideas and defining and acquiring the various systems have a certain commonality. Even though there are significant differences in hardware and complexity, similar system program management techniques can be used to acquire different systems.

For a faster way to develop, test, build, and make a system operational, the concept of concurrency is used. Under this concept, the development and test of several parts of a system are conducted at the same time.

The interdependence of the military/civilian industrial community is increasingly evident as the technical state-of-the-art is advanced and systems become more complex. The role of industry is now that of a full partner on the joint military/industry team.

The role of industry as a "defense industry" has as a peculiar problem the unpredictable market for future defense systems or related services. This affects directly the type of organization and the methods of operation employed.
The challenge arises from demanding technological requirements and interfaces, combined with a massive diversity of organizational participation.

A primary reason for program management organization is to achieve some measure of managerial unity, such as unity of communication, control, direction, and command. It is a centralization of all related systems activities into one area.

The concept of program management is still in the development stage. Because it is embodied in government directives, it has taken on a recognizable form, language, content, and set of requirements or criteria.

Program management involves a new way of thinking and doing that recognizes that the management sciences must keep pace with the technological sciences which they serve.

Legal/Contractual Aspects

Its adoption as a requirement in major systems and other acquisitions by the Military Services and the Defense and Space Agencies has implanted the concept of program management firmly into the thinking and operational practices of the industrial community.

Procurement by a government service from a contractor is generally based upon the procurement authority of the Armed Services Procurement Regulations,
up-dated by current procurement directives, in response to a solicited or unsolicited request for a proposal, as negotiated into a contract. The Procurement relationship is, therefore, a contractual relationship, embodied in a specific contractual document and in all the related applicable directives which by reference are made a part of that document.

The prime contractor does not have complete and overall performance freedom. He must operate within certain boundaries and perform, record, and report at certain times in certain ways. The government has established, and is continuing to up-date and further establish, a growing body of rules, regulations, criteria, and specifications to govern this contractual obligation.

There is no universal "right way" by which program management is performed. There is no supreme central authority or binding point of reference that can establish, direct, or require that a given effect always follows each given cause. It is a developing, dynamic technique that must be judged by its effectiveness in its application and by criteria for its performance rather than by specific rules of conformance.

Program Management Organization

The particular type of management ability needed is capable of handling a major job of a substantially
different nature than that customarily found in industry. The job is limited in duration and involves dealing with one or only a few customers. Many and different types of skills, unique and complex, are involved for varying periods of time. The end products are required to conform to and perform to exceedingly rigid specifications of a highly technical nature. The technologies and skills involved might press beyond the known frontiers of the concerned sciences. The ability to plan and replan in the light of new and changing developments on a constant and continuing basis is the way of life for the duration of the job.

The concept of program management is typified by certain characteristics in its organization and objectives, such as:

1. The establishment of a program manager and a program organization for the accomplishment of a single specified program or purpose, designed to fit the situation and the tasks;

2. The existence within the parent company of the program management organization as an individual entity, with its own flexible organization structure, to accomplish its designated purpose,
but without its own individual administrative existence; and

3. Management planning systems and information flows that are realistic, foresighted, and prompt so as to allow immediate corrective actions, when needed, as well as to monitor progress and determine status.

Industrial program management serves many purposes. Typical purposes are visibility and control of business commitments, attention to plans, details, and facts that might otherwise be overlooked, systematic performance and variance analyses, and progress, cost, and status reporting.

Program management procedures force a contractor to perform and to commit to a degree of advance planning and programming. Programming is concerned with determining the what, how, where, and when of the various requirements and the decisions for the appropriate actions to be taken. The progress and the results are then watched on a continuous comparative basis.

There are various types of program management organizations. Each type has its own advantages and disadvantages.
A continuous chain of specific responsibility exists at all times, through all organizations, for each work package, task, project, or program.

Program administrators must have the ability to visualize and to plan the administrative networks and paperwork systems so that the desired and necessary bits of data are properly and progressively created along the way.

The technical areas and the areas of performance are where the sense of cost-consciousness is most effective.

The successful experiences of other program managers, administrators, and technical areas are useful guides for new programs.

Since management support can be, and is, expressed in a variety of ways, care must be exercised constantly to assure that the distinction between management support and management interference is respected.

The Program Office

The program office manages all of the effort that produces a system. It manages the effort that brings all of the ingredients together at the proper and preselected time so that a new system exists where none existed before.

The reason for creating a program office is to optimize the time, cost, and total system performance.
Implicit is a sound knowledge of the processes through which the program must travel and recognition of the environment in which a program lives from beginning to end.

Although the program office is an organizational entity, the effectiveness of its management is dependent upon the day-to-day actions of the assigned individuals.

A capability must exist within the program office to analyze the status and outlook of schedules, cost, and performance.

There is a recognized need for the identification of unpredicted changes.

Stability of the program depends, to a large extent, on the accurate estimates and the timely funding in sufficient quantity to accomplish the planned effort. Consequently, up-dating of cost estimates is imperative.

An important financial functional area is that of tracking the program. This area compares the actual and forecast dollars, manpower, and schedule achievements against the basic plan on which the cost estimates are prepared.

Financial management activities include reports and periodic meetings to assure effective utilization and control of funds allocated. When manhours used exceed the plan, it probably means future problems in schedule and
Now is the time to make a detailed investigation and recommend possible solutions to the program manager.

The AFSCM 375- series of manuals are written from the point of view of, and directed to, those concerned government or customer personnel rather than to their industrial counterparts. Accordingly, the industrial systems and procedures must be so planned and so followed that the industrial outputs will provide the inputs required by the governmental system organizations.

The Program Manager

The System Program Director is the highest official, or manager, representing the government, or the customer, for a particular weapon system or program element. Under the weapon system concept, the prime contractor likewise assigns a high management official, or manager, to represent the contractor for that particular system or program.

The program manager acts with the delegated authority of a division or other top level manager, acting in the light of and in the right of that manager. In essence, he is an agent—and a very responsible agent—for top management.

Although technological matters are of great concern to the program manager, managerial skill plays the principal role.
In the final analysis, the program manager is responsible for the total program while his subordinates are responsible for specific tasks or objectives.

The function of a program manager requires a balancing of technical solutions with time, cost, resource, and human factors. The program manager is an integrator and a generalist rather than a technical specialist.

Program managers devote most of their management time to the functions of planning and control.

A program manager reaches others to explain plans and to accomplish control only through the activity of communication. Face-to-face communication is the principle communication method by which he accomplishes his management job.

The effectiveness and the ability with which a successful program manager performs are due in large part to the special attributes, innate talents, experience, and training which he possesses. Just as important as having the ability to perform, however, is having the opportunity to perform. Without the realistic test of opportunity and performance, ability as a program manager is difficult to assess.

Rules of Conduct

As much as is possible, know every aspect of the program.
Know something about related programs.

Distinguish between the important and the unimportant. Concentrate on the important.

Adjust briefings to the audience.

Pass information to concerned personnel as soon as possible, especially if it impacts schedule, cost, or performance.

Do not spring surprises. Keep management informed.

Do not try to fool people at high levels. Both technical and management competence exist there.

Recognize that the decision-making processes are becoming centralized. Get in the loop.

**Industrial Program Management**

People, not data or information, get things done. A system, to be of use or value, should result in indicating or making action by people possible or necessary.

The uniqueness of the defense industry is expressed primarily by an organization designed mainly to meet the needs of its major customers--the various government services and agencies. The policies, practices, systems, and procedures governing the internal industrial operations are influenced by and designed to meet the requirements established by these customers. While the
manner of thought, expression, and performance might appear at variance with that which might be used in a comparative commercial situation, the criteria for judging appropriateness should be the same in either case. The criteria is whether or not the desired results are being obtained by the means used. When the customer is willing to, and does, pay for the particulars and peculiarities which he requires and specifies, performance and compliance in these respects become contractual obligations.

Industrial program management is that view from within a company in response to and in interaction with a contracting government agency requirement.

The integrated Work Breakdown Structure is basically the framework for a program or project. It is the graphic presentation of the program or project relationships, interdependencies, and objectives.

Planning, programming, reporting, and control are fundamental tasks of management:

a. The programming system permits an integrated look at programs in order to make continual cost versus effectiveness comparisons.

b. Reporting and control mean monitoring and guiding the progress of a program within the parameters established. When actual progress varies from that planned,
redirection of resources is usually required.

c. There are many types of management tools available for accomplishing control. It is the responsibility of the program manager to insure that the particular method utilized is suited to the program needs.

Criteria of good management control are:

a. The control system must satisfy the needs of the program.

b. It must be flexible to unforeseen program changes.

c. It must be understandable to the user.

d. It must be worth the cost of operation.

e. It must provide timely information.

f. It must show where and why failures will occur if corrective action is not taken.

The manner in which program management operates is dependent upon the specific situation and upon how the program management function is applied. Program management results only from planning, organizing, and implementing it.
CHAPTER XII

SUMMARY AND CONCLUSIONS

The whole concept of joint participation by industry and government in both the development and management aspects of systems and programs is still relatively new and is not as yet completely defined. The government, for its part, has developed a procedural system and has published various directives to cover its functions under its new weapons system concept. These directives establish that certain data, functions, and activities are required by the various government personnel and agencies. Accordingly, the counterpart industrial systems and procedures must be so planned and so followed that the industrial outputs provide the inputs required by the government system organizations.

The problem in industry is that it must first understand what the government's required inputs are and how the government's systems operate. With this understanding, individual industry members can plan and operate so as to produce the required outputs. The situation is somewhat complicated by the fact that the industrial outputs are required to be provided in accordance with certain of the government's criteria and specifications.
The problem for industry essentially becomes a need to better understand and to improve the business management aspects of its own industrial program management. This points out the need for publications or bodies of informative and recognized literature that can guide the related internal approaches to be followed by industry personnel. In this new, developing field, there are as yet few, if any, generally recognized and acknowledged experts.

Under these circumstances, this study, based on interest and personal experience, was undertaken, not as an attempt to rigorously prove or disprove a hypothesis as such, but as an attempt to enlarge upon the knowledge concerned with the field of industrial program management.

The study started by looking into the role of industry in the systems definition and acquisition phases. The concept of program management, the function of the Work Breakdown Structure, and the purpose of the program office preceded the discussion of the characteristics of program management.

The organization and administration, the direction and controls, and the roles and functions in staffing of the program management area were discussed in some detail. The listing of some program management problem areas was followed by a discussion of suggested improvements.
The drawing of some principles, defined as generalizations used as a basis for reasoning or as a guide for conduct or procedures, completed this study.

Conclusions

Studies of this type are important to that segment of industry which presently does, or will do, business with the various government agencies which require program management as a standard industrial operating procedure. In such instances, this requirement becomes a contractual obligation involving compliance and fulfillment. It is imperative that contractors be fully aware of the obligations and requirements to which they are agreeing. From a review of the criteria used to determine the applicability of program management, it is probable that more, rather than less, applications will be required in the future.

In Chapter I, the question is raised as to the source of informative and practical data and literature on the subject of program management. Although it is increasing, there is still only a relatively small amount of literature being published and this is mainly of a general nature. The teaching is mainly in industry due to the contractual necessity for trained personnel. Because of the investment in system, facilities, personnel,
and training costs, there is little inducement for a company to extend its know-how to outsiders or to potential competition.

Program or system management is basically a management tool that should be able to stand on its merits alone to give it acceptance and use. However, its incorporation into contractual provisions makes it an obligation rather than a choice.

This study into the philosophy, policies, principles, or guides that are involved in industrial program management indicates that there are certain generalizations that can be proposed as principles of program management. These principles, set forth in Chapter XI, can be used to better understand and to improve the business management aspects of industrial program management.
BIBLIOGRAPHY

BOOKS


Hower, Ralph M., and Orth, Charles D. Managers and Scientists. Boston: Graduate School of Business Administration, Harvard University, 1963.


ARTICLES AND PERIODICALS


Likert, R. "Improving Management," Personnel Administration, XXVI (September, 1963), 5-11.


"Riding Herd on the Contractors." Newsweek, October 9, 1967, 69.


PUBLIC DOCUMENTS


REPORTS


---

