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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

ORGANIZATION DESIGN AND PROGRAM INTEGRATION: A STUDY OF THE GOVERNMENT-INDUSTRY FIELD MANAGEMENT OF THE SAFEGUARD PROGRAM

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

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degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

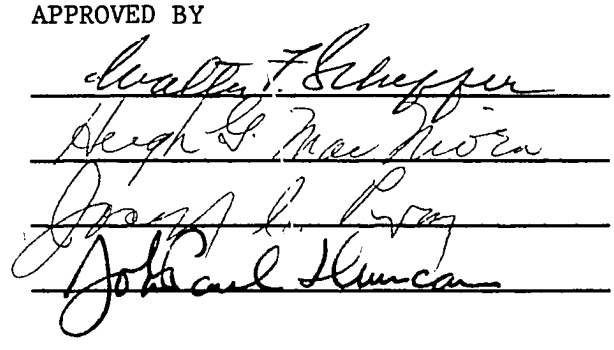
1971

ORGANIZATION DESIGN AND PROGRAM INTEGRATION:

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THE SAFEGUARD PROGRAM

APPROVED BY



DISSERTATION COMMITTEE

TABLE OF CONTENTS

Page

LIST OF ILLUSTRATIONS v

INTRODUCTION 1

Chapter

I. THE PROGRAM AND SYSTEM 4

Historical Evolution
System Purpose and Description
Scope and Complexity

II. ORGANIZATION DESIGN 11

Composite Overview
Government Structure
Industry Structure
Government-Industry Interface

III. PROGRAM INTEGRATION 41

What It Is and Why It Is Necessary
Government Concept
Industry Concept
Government-Industry Composite

IV. ANALYTICAL FRAMEWORK 54

Conceptual Model
Operational Model
Rationale for Model

V. GOALS 85

Government-Industry Similarities and Differences
Interrelationship Implications
Summary

VI. PLANNING 105

Government-Industry Similarities and Differences
Interrelationship Implications
Summary

Page

VII. CONTROL 119

Government-Industry Similarities and Differences
Interrelationship Implications
Summary

VIII. EFFICIENCY 138

Government-Industry Similarities and Differences
Interrelationship Implications
Summary

IX. COMMUNICATIONS 152

Government-Industry Similarities and Differences
Interrelationship Implications
Summary

X. SUMMATION OF INTERRELATIONSHIPS 164

Sensitive Aspects of System Elements
Theoretical Hypothesis
Transitional Hypothesis
Composite Hypothesis

XI. CONCLUSION 183

Implications of General Applicability
Applied Safeguard Peculiarities
Safeguard Implementation

BIBLIOGRAPHY 197

LIST OF ILLUSTRATIONS

Figure		Page
1.	Government-Industry Organization Relationship Overview ..	13
2.	Program Overview From Equipment Perspective	14
3.	Safeguard System Organization	19
4.	Major Government Program Participants	21
5.	Government Field Management Structure	25
6.	Safeguard System Command Organization Structure	26
7.	Western Electric Company Organization Overview	30
8.	Western Electric Company Safeguard Project Structure	32
9.	Western Electric Project Organization Structure	33
10.	System Life Cycle Phasing	37
11.	Government-Industry Organization Design, Functional Interface	50
12.	Government-Industry Organization Design, Product Interface	52
13.	Conceptual Model	56
14.	Operational Model	58
15.	Government-Industry Organization Goals Comparison	94
16.	Interrelationship Implications Resulting From Goals	104
17.	Government-Industry Planning Comparison	115
18.	Conceptualization of Control	120
19.	Interrelationship Implications Resulting From Control ...	135
20.	Interrelationship Hypothesis-Theoretical	174

Figure Page

21. Interrelationship Hypothesis-Transitional 177

22. Interrelationship Hypothesis-Composite 180

INTRODUCTION

This is an analysis of the interrelationship of organization design and program integration in field management of the Safeguard Ballistic Missile Defense System Program. The analysis is performed by means of a study of both the government and industry Safeguard Program field management organizations, with particular emphasis on the United States Army Safeguard System Command, Huntsville, Alabama, and the Western Electric Project Organization, Greensboro, North Carolina.

The analysis is conducted through the use of a simple system model. The system model is open in the sense of considering influences from certain environments, yet closed in the sense of consideration of all possible environmental influences. The system model employs goals, planning, control, efficiency and communications as the conceptual representations of the system model elements of boundary, input, conversion, output and feedback.

Field management is used in the context of the implementation phase of the traditional policy-implementation paradox. Field management relates to those government organizations and activities at the field command-specialized agency level and to those industry organizations and activities at the project management level.[1] Field management is

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[1] These levels will be explained in Chapter II.

concerned with the influencing, interpretation, implementation and monitoring of program decisions evolving from the general policy level.

Field management of the Safeguard program is a joint responsibility of the government and the Western Electric Company. The Safeguard System Command is the "lead" government organization while the Western Electric Project Organization is the "lead" industry organization for field management.

The interrelationships of organization design and program integration in field management of the program are analyzed relative to each of the conceptual representations used to portray the elements of the system model. The conclusion is the development of a theoretical hypothesis of the interrelationship of organization design and program integration and the development of operational indications that are applicable to both Safeguard program peculiarities and to similiar programs and organizations.

Standard terminology is used where possible. When not possible, definitions are provided at the point where the non-standard terminology is first used.

Numerous illustrations are provided for the purpose of establishing and maintaining the context and perspective of the subject being discussed. Use of the illustrations is necessary for those not intimately familiar with the Safeguard program or its field management.

The opinions, conclusions and interpretations expressed herein are the result of independent research and do not necessarily reflect the views of the Department of the Army or the Western Electric Company.

ORGANIZATION DESIGN AND PROGRAM INTEGRATION: A STUDY OF THE GOVERNMENT-INDUSTRY FIELD MANAGEMENT OF THE SAFEGUARD PROGRAM

CHAPTER I

THE PROGRAM AND SYSTEM

The importance of the Safeguard program is evident from its impact on international political considerations,[1] strategic defense planning,[2] and national goal assessments. Its role in the international nuclear balance and its long-range impact on the national budget makes it susceptible to inclusion in major economic and political considerations at the national level.[3]

Historical Evolution

The Safeguard program was not conceived in the months, or even years, immediately preceding the 1969 decision to begin deployment of the system. It is the result of an evolutionary process in the sphere of air defense protection, spanning approximately twenty years. In the

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[1] U. S., Secretary of Defense Melvin R. Laird, Report to Congress, "Fiscal Year 1970 Defense Program and Budget," February 20, 1970.

[2] Herman Kahn, "The Case of a Thin System," Unpublished Report of the Hudson Institute, May 27, 1969.

[3] U. S., President Richard Nixon, A Report to Congress, "U. S. Foreign Policy in the 1970's; a New Strategy for Peace," February 20, 1970.

late-1940's, the Nike Ajax air defense program was initiated, marking the beginning of a continental United States air defense capability by means of a surface-to-air missile system. In 1953 the Nike Hercules air defense program was initiated to provide increased capabilities beyond that of Nike Ajax. Nike Hercules was a second generation approach to the surface-to-air missile defense requirements.

With the development and subsequent deployment of Intercontinental Ballistic Missiles (ICBM), a concurrent awareness developed of the need for protection of the United States from possible nuclear attack by Intercontinental Ballistic Missiles. In response to this need, the Nike Zeus program was initiated in the mid-1950's. Nike Zeus utilized certain technology and concepts developed in previous ballistic missile defense research efforts. In 1963 the Nike Zeus program was reoriented to the Nike-X project. The Nike-X project was a continuation of the evolutionary process of developing an anti-ballistic missile defense capability. In 1967 the decision to begin deployment of an anti-ballistic missile defense system was made.[4] This deployment was given the title of Sentinel system. The Sentinel program envisioned a limited degree of protection of the United States against a Soviet ballistic missile threat. The program was designed to provide both likely enemy attack route and area coverage of the United States.

With the change of national administration in January 1969, a comprehensive review was made of the 1967 decision to deploy the Sentinel system, as well as the current and projected ballistic missile threats and

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[4]U. S., Department of the Army, General Order 48, "U. S. Army Sentinel System Organization Established," November 15, 1967.

the Sentinel system deployment's probable impact on United States-Soviet relations. From this review a decision was made to reorient the Sentinel program to the Safeguard program. On March 14, 1969, President Nixon announced these decisions.[5] The Safeguard and Sentinel titles are used interchangeable in reference to the system. This is due to the Safeguard program being a continuation of the Sentinel program with different threat bases, deployment arrangements and equipment configuration.

System Purpose and Description

The March 1969 decision to begin deployment of the Safeguard system outlined a program aligned to fulfill three objectives:[6]

1. Protection of the United States land-based retaliatory forces (Minuteman Intercontinental Ballistic Missiles and Strategic Air Command manned bombers) against direct attack by the Soviet Union.

2. Defense of the people of the United States against the kind of nuclear attack which Communist China is likely to be able to mount within the decade.

3. Protection against the possibility of accidental attacks of the United States from any source.

The program concept for Safeguard is one of a limited initial deployment (two sites initially authorized), with an annual reassessment of the technical Safeguard system developments, the Intercontinental Ballistic Missile threat to the United States and the international

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[5] U. S., Executive Office of the President, Weekly Compilation of Presidential Documents, "Statement by the President Announcing His Decision on Deployment of the Ballistic Missile Defense System," March 14, 1969.

[6] Ibid.

nuclear arms environment as bases for subsequent incremental deployment decisions.[7] Areas near Grand Forks Air Force Base, North Dakota[8] and Malmstrom Air Force Base, Montana[9] were selected as the two initial Safeguard system deployment sites. This limited initial deployment was approved by Congress in 1969.

The total Safeguard program, as outlined by President Nixon in March 1969, ultimately includes twelve sites. The administration proposed for Fiscal Year 1971 authorization to deploy one additional site at Whiteman Air Force Base, Missouri, deployment of additional Sprint missiles at the two sites already authorized and authorization to begin long lead-time activities associated with possible future deployment of five additional sites.[10]

The Safeguard system includes five major equipment subsystems, as well as a large amount of ancillary and supporting equipment. The major equipment subsystems are the Perimeter Acquisition Radar (PAR), Missile Site Radar (MSR), Spartan interceptor missiles, Spring interceptor missiles and large capability data processing centers.

The Perimeter Acquisition Radar performs the function of detecting attacking warheads at long range. The radar utilizes a phased array

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[7] Ibid.

[8] U. S., Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs), News Release No. 839-69, "Selection of Tentative Safeguard Facilities in North Dakota," October 8, 1969.

[9] U. S., Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs), News Release No. 892-69, "Selection of Tentative Safeguard Facilities in Montana," October 8, 1969.

[10] U. S., Deputy Secretary of Defense, David Packard, Report to The House Armed Services Committee, March 9, 1970.

method that permits radar scan on a milliseconds scale. Once the Perimeter Acquisition Radar detects an attacking warhead, it tracks the warhead, computes the probable intercept point and relays the information to an appropriate Missile Site Radar for futher tracking and intercept control. A high speed, large capacity data processing system is associated with each Perimeter Acquisition Radar. The Perimeter Acquisition Radar is housed in a nuclear hardened structure of some 200 feet square at the base and the equivalent to a twelve-story building in height. Located with the Perimeter Acquisition Radar are administrative buildings, an underground power plant and living quarters for the crew.

The Missile Site Radar performs the function of accepting detected attacking warheads from the Perimeter Acquisition Radar, predicting the track of the incoming warhead, computing the probable point of intercept, readying interceptor missiles for launch and guiding the interceptor missiles to intercept. It also employs phased array radar concepts and has associated with it a high speed, large capacity data processing system. The Missile Site Radar is housed in a nuclear hardened structure of approximately 230 feet square at the base and approximately 120 feet in height. In addition to the Missile Site Radar building, power plants, administrative buildings, living quarters and interceptor missiles are located at the Missile Site Radar site.

The Spartan missile provides a long-range intercept capability for the Safeguard system. It is a three stage, solid propellant missile launched from an underground silo. The Spartan missile has a nuclear warhead capability and a capability of operating outside the atmosphere.

The Sprint missile provides the Safeguard system with an intercept capability at closer ranges. It is a solid propellant missile, ejected

from its underground silo prior to booster ignition, and has a nuclear warhead capability. The Sprint missile is guided in flight by the Missile Site Radar.

The data processing subsystem consists of the data processing equipment previously identified in association with the Perimeter Acquisition Radar and the Missile Site Radar, as well as the Ballistic Missile Defense Center that provides central system integration and control. The data processing subsystem processes and evaluates the large amount of information accumulated by the radars and provides the means for the human to control the system.

Scope and Complexity

A highly complex set of interrelationships and interdependencies exist in the development, production, deployment and logistical support of the Safeguard system and its field management. Scores of government organizations and multi-thousands of industrial concerns are involved in the development, manufacturing, construction, installation, support and servicing of the system. Some degree of government and industry participant involvement in the program is illustrated in Chapter II. The integration of the efforts of these many program participants is one of the most critical challenges to management of the program.

The annual reassessment and incremental deployment approval requires a dynamic view of program plans, concepts and techniques. Maintenance of this dynamic view is also a critical challenge to management of the program which must be faced in the current environment of governmental emphasis on economy and austerity.

The acqusition cost of the full Safeguard program (ultimate twelve sites) is currently estimated at $10.7 billion (December 1969 price levels) and represents a $1.6 billion increase in the previous estimated cost of the program (December 1968 price levels).[11] This increase is a result of inflation in price levels, program stretch-out, changes to the system and better estimating of the costs.[12] The presently approved Safeguard program and the modified expansion requested by the administration for Fiscal Year 1971 represents an acquisition cost of some $5.9 billion.[13] With the magnitude of cost involved (approved, requested or total) and the tendency of weapon system program costs to escalate from early estimates, costs and cost control are of major importance to management of the program.

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[11] U. S., Deputy Secretary of Defense, David Packard, Report to the Senate Armed Services Committee and Senate Appropriations Defense Subcommittee, February 24, 1970.

[12] Ibid.

[13] Ibid.

CHAPTER II

ORGANIZATION DESIGN

The purpose of this chapter is to provide an understanding of the organization design structure of the program so that the subsequent analyses can be viewed in their appropriate contexts. The discussion progresses from, initially, a view from the broad perspective of total program, through both the government and industry organization design structures to, finally, the basic field management organization structures of both government and industry.

Organization design structure is used in a broader sense than only that of formal organization structure. It also includes the philosophies, principles and methodologies used by the formal organization structure for administration and management of the program.

Composite Overview

The Congressional and Presidential level involvements of the Safeguard program have been set aside as those normally associated with any major defense weapon program. These normal involvements are compounded by the international arms balance, large dollar investment and advanced technology aspects of the Safeguard program.

The Department of Defense is responsible for administration of the Safeguard program and has assigned program executive responsibility to

the Department of the Army. Western Electric Company has been selected as the prime contractor for the program.

Figure 1 provides an overview of the composite organization design structure of the program. Within the government organization there is a central flow from the executive responsibility of the Secretary of the Army, through the project/system management embodied in the Safeguard System Manager, to field management reflected by the Safeguard System Command. Within the industry sector there is a central flow from the prime contractor responsibility of Western Electric Company, through the defense programs focus of the Defense Activities Division, to the field management orientation of the Western Electric Project Organization.[1]

Figure 1 by no means illustrates the magnitude and complexity of total program participants. Its purpose is only to provide an initial reference framework for the more detailed subsequent analyses. A generalized correlation of the two organization design structures can be rationalized from the figure, although direct correlations between the government and industry program organizations are difficult. This difficulty contributes to the complexity of integration of the program.

A different perspective can be obtained from Figure 2. This figure reflects an oversimplification of the organization design structure for the program from the perspective of system and support equipment development, production and installation. Western Electric Company as prime

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[1]The two major segments of the Safeguard program, research and development and production and deployment, are the responsibilities, respectively, of the Bell Telephone Laboratories and the Western Electric Project Organization. To alleviate misinterpretations, subsequent reference to Western Electric Company includes equal reference to the Bell Telephone Laboratories.

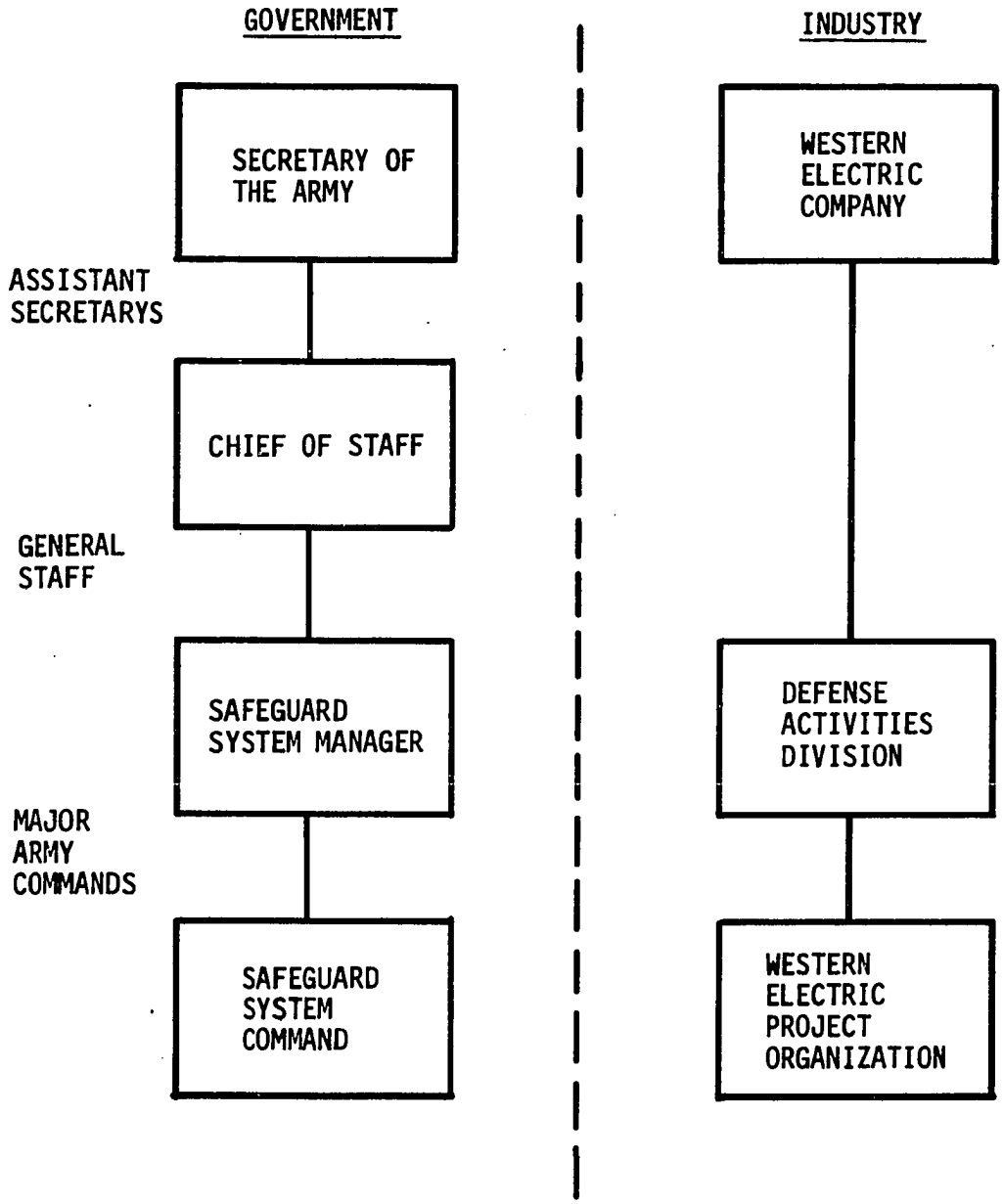


FIG. 1.--GOVERNMENT--INDUSTRY ORGANIZATION RELATIONSHIP OVERVIEW

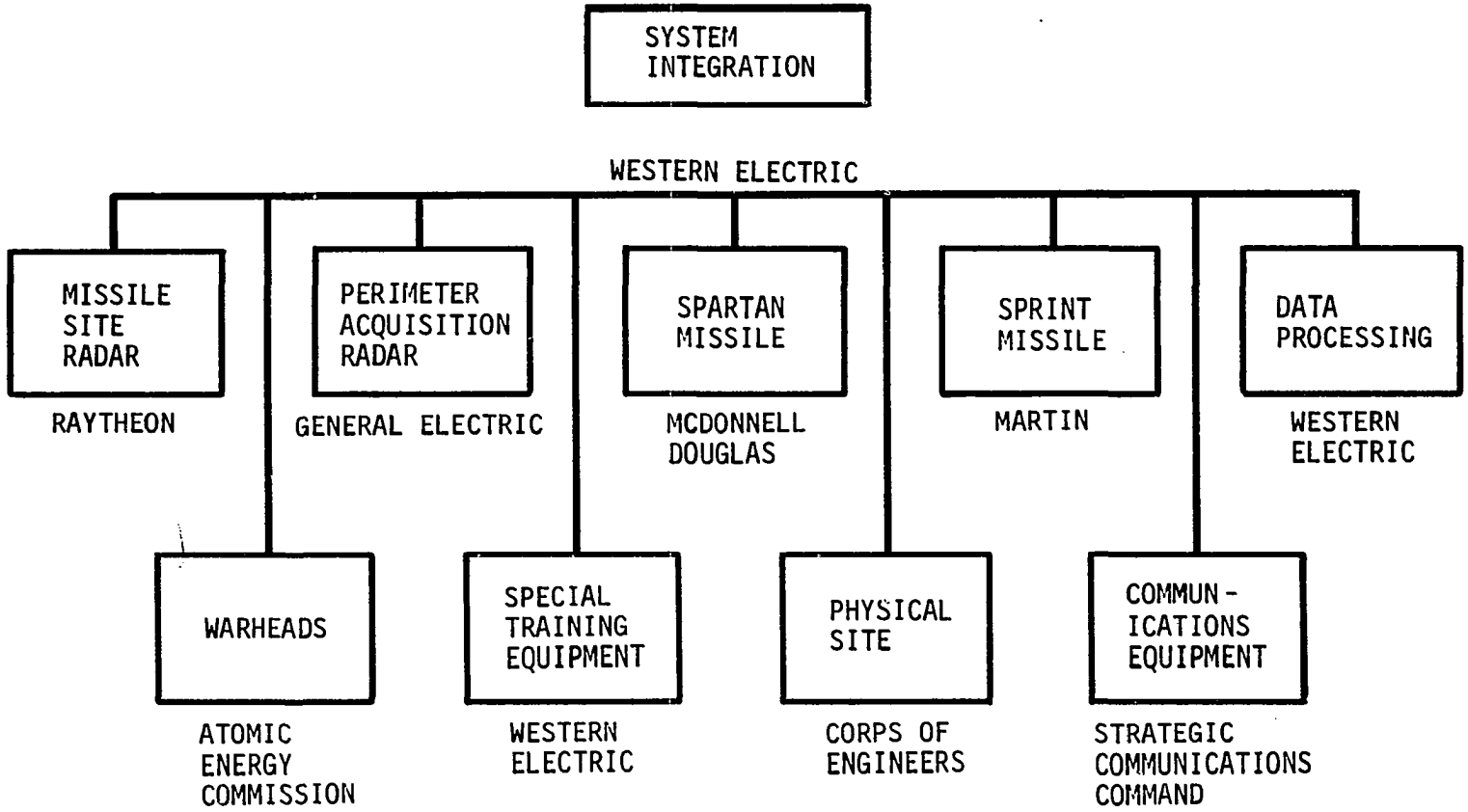


FIG. 2.--PROGRAM OVERVIEW FROM EQUIPMENT PERSPECTIVE

contractor, is responsible for the integration of the equipment into a composite system, as well as having prime development and production responsibility for the data processing subsystem and for special training equipment. McDonnell-Douglas Company has prime development and production responsibility for the Spartan missile, as do the Martin Company for the Sprint missile, Raytheon Company for the Missile Site Radar and General Electric Company for the Perimeter Acquisition Radar. Certain government organizations also have prime development and production responsibilities for equipment and support areas. These are illustrated by the Atomic Energy Commission responsibility for warheads, the Strategic Communications Command responsibility for communications equipment and the Corps of Engineers responsibility for physical sites.

There are other equipment and support areas associated with the system in addition to those shown in Figure 2. These additional areas fit into either the Western Electric Company system integration responsibility, or into one of the subsystems of special areas. The development, production and installation responsibilities of the different industrial concerns and government organizations are indicative of the complexity of integration requirements in the program.

The equipment perspective of the program is a pyramidical arrangement, with Figure 2 reflecting the major elements of the upper two levels of the equipment pyramid of the system. To illustrate the complexity of the equipment arrangement for the program, Raytheon Company responsibility for development and production of the Missile Site Radar requires use of digital racks produced by Western Electric Company and supplied to Raytheon Company. The manufacturing of the digital racks by Western

Electric involves use of integrated circuit packages that are produced by three other industrial concerns and supplied to Western Electric Company. The Raytheon Company responsibility must be discharged within the constraints imposed by Western Electric Company as the integrator of system equipment, as prime contractor and, through the Bell Telephone Laboratories, as the system design agency.

The contractual concept for the Safeguard program is based on a comprehensive government contract with Western Electric Company for almost all of the industry requirements of the program. Western Electric Company, in turn, subcontracts with other industrial concerns for certain program areas. For example, it subcontracts with Bell Telephone Laboratories, a sister American Telephone and Telegraph Company element, for design agency services and for development of the system. Equipment subsystem development, production and installation is subcontracted by Western Electric Company to such industrial concerns as Raytheon Company, General Electric Company, McDonnell-Douglas Company, Martin Company, Lockheed Company, and many others.

Under such a contractual arrangement, the government does not deal directly with the industrial concerns responsible for development, production and installation of subsystems. Western Electric Company acts as the intermediary between the government and industrial concerns responsible for subsystems. Consequently, the government must depend upon the Western Electric Company for management of the industrial efforts of the program, with the exception of a small number of direct government-industry contracts that are outside the Western Electric Company "umbrella" coverage. Obviously, the company occupies a position

of mutual responsibility in field management of the Safeguard program. Interface of the government and industry organization design structures is of major importance in accomplishing program objectives.

Government Structure

The Safeguard program employs the system manager concept of management.[2] Under the system manager concept, the Secretary of the Army designates an individual to exercise centralized management at Department of the Army level for projects that meet one or more of the following criteria:[3]

1. A system whose development and deployment would significantly influence, for an extensive period of time, national interest elements other than those of a purely military nature.

2. Hardware system subelements or components are anticipated to require exceptional and lengthy study and experimental effort.

3. A system whose nonmaterial subelements cannot yet be optimized.

4. Definitive cost and schedule data for the system depends on trade-off studies that cannot yet be undertaken.

The Safeguard program meets these criteria for system management.

The Secretary of the Army has designated the Safeguard program for system management and has appointed a Safeguard System Manager and established a Safeguard System Organization to accomplish the government

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[2]U. S., Department of Defense, Department of Defense Instruction No. 5010.14, "System/Project Management," May, 1965.

[3]U. S., Department of the Army, Army Regulation No. 70-17, "System/Project Management," (Washington: The Adjutant General, 1968).

system management.[4] Figure 3 reflects the Safeguard System Organization. The Safeguard System Manager and the Safeguard System Office are located in the Washington, D.C. area, the Safeguard System Evaluation Agency at the White Sands Missile Range, New Mexico, and the Safeguard System Command at Huntsville, Alabama.

The System Manager exercises operational control over material development and coordination and directive authority over nonmaterial oriented activities of the program. The System Office provides a staff to assist the System Manager in his direct responsibilities and maintains continual liaison with other government organizations involved in the program, particularily at the Department of the Army, Department of Defense and legislative levels. The System Evaluation Agency provides the System Manager with the capability of performing independent studies and tests to insure that the system will meet required standards and established system objectives. The System Command is the major field management element of the System Organization and is responsibile for the development, deployment and activation of the system.

The use of the system manager concept might be construed as a straight-forward, uncomplicated management environment for the Safeguard program. If the System Organization (Figure 3) represented the only government program participants, this would be the case. This is not the actual case, as there are many government organizations outside the System Organization that play major roles in accomplishing Safeguard program objectives.

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[4]U. S., Department of the Army, "System Charter, Safeguard System," June 20, 1969.

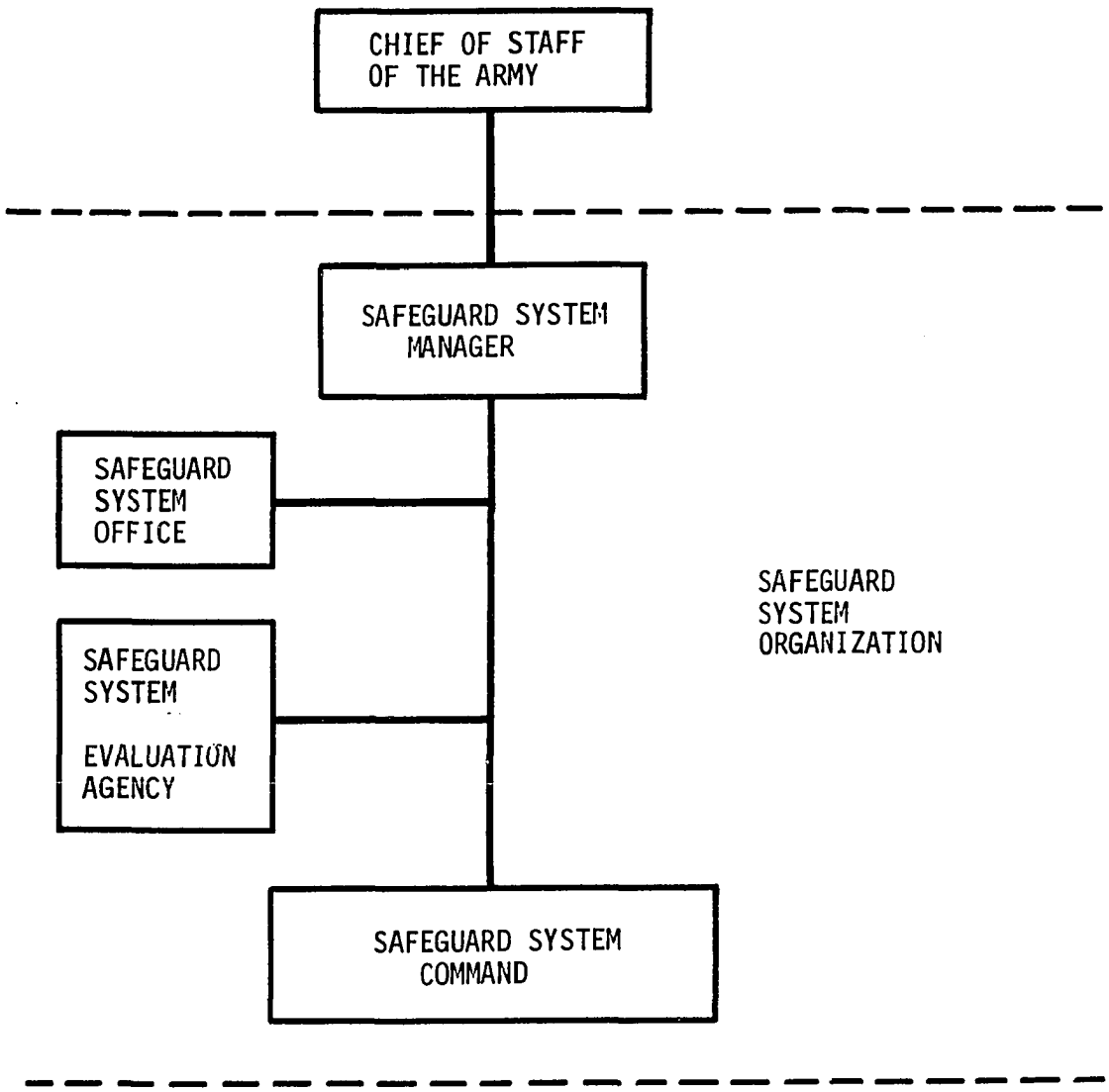


FIG. 3 .--SAFEGUARD SYSTEM ORGANIZATION

Figure 4 illustrates the scope and complexity of government program participants. Although it does not reflect all government program participants, it suffices to illustrate government program participant complexity.

The Assistant Secretary level at Department of Defense (particularly the Assistant Secretaries for Installation and Logistics and Comptroller, as well as the Director, Defense Research and Engineering) and Department of the Army (particularly the Assistant Secretaries for Installations and Logistics, Financial Management and Research and Development) provide policy direction and program monitoring and assessment. The Assistant Secretary level at Department of the Army functions through an Anti-Ballistic Missile Review Group whose mission is to assure cost effectiveness and reliable performance of the system.[5]

Within the Department of the Army General Staff, service-wide functional responsibility is assigned to the Deputy Chief of Staff for Logistics, Chief of Research and Development and Assistant Chief of Staff for Force Development, for those specified functions. Safeguard program activities falling within the scope of these service-wide responsibilities must be coordinated with the appropriate General Staff element.

Among the major Army commands, the Army Material Command, Army Air Defense Command, Corps of Engineers, Continental Army Command and Strategic Communications Command each plays a vital role in accomplishing program objectives.

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[5]U. S., Department of the Army, Chief of Staff of the Army Memorandum 67-449, "Nike-X Program Review Group," November 15, 1967.

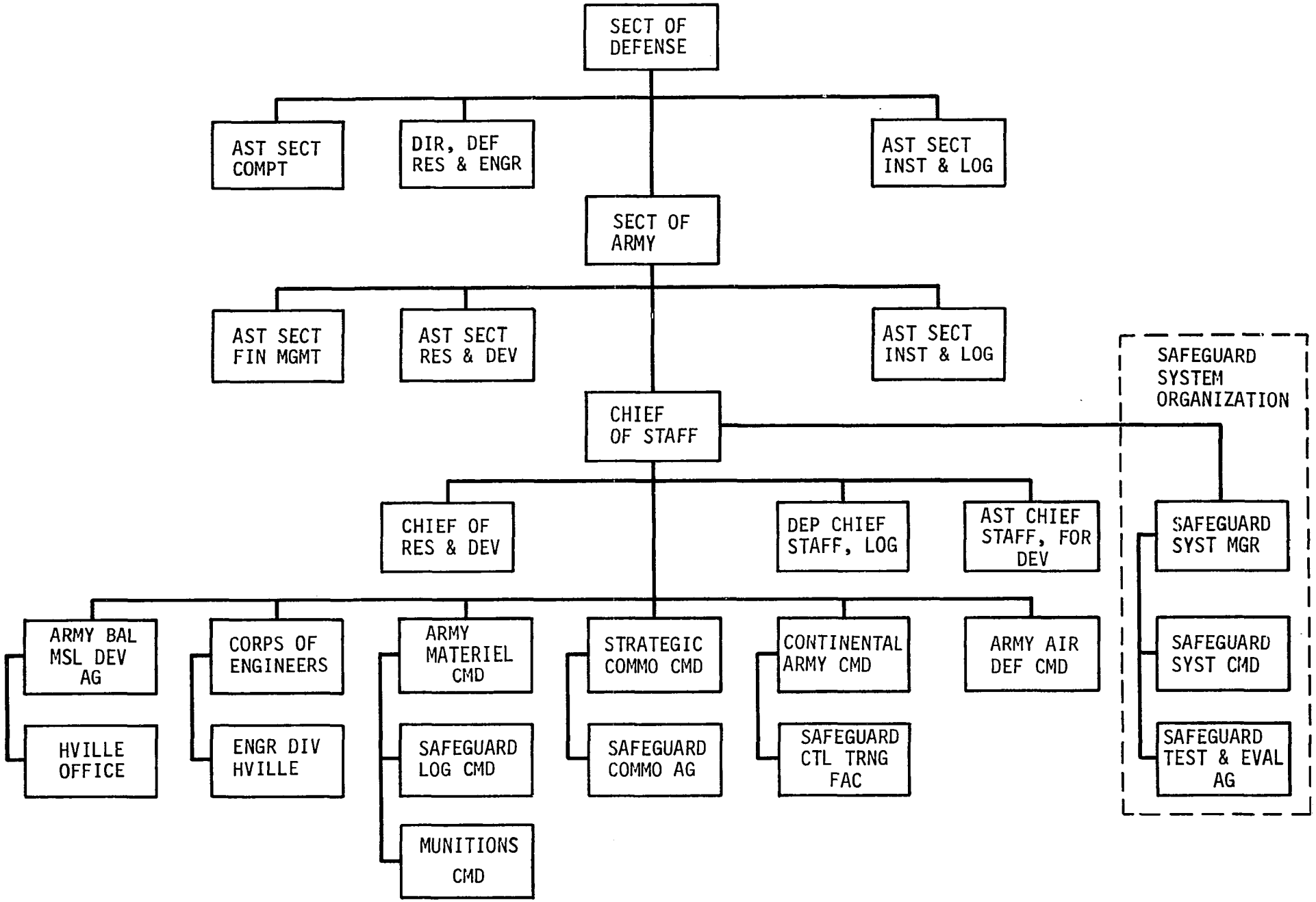


FIG. 4.--MAJOR GOVERNMENT PROGRAM PARTICIPANTS

The Army Material Command provides traditional supply and maintenance support for the system.[6] This support is provided through a special Safeguard agency, the Safeguard Logistics Command, that is co-located with the Safeguard System Command and through use of standard commodity commands. The use of standard commodity commands is illustrated by the Munitions Command providing Safeguard program missile motor loading support.

The Army Air Defense Command is the ultimate user, or customer, of the Safeguard system.[7] At the present time they are identifying user requirements and training, personnel manning requirements and support equipment criterion. The Continental Army Command is responsible for training system operating personnel and for maintenance and supply of site facilities.[8] A special Safeguard agency, the Safeguard Central Training Facility, has been established to provide the required operator training support.

The Corps of Engineers is responsible for site selection and building construction.[9] Another special Safeguard agency, the Huntsville Division, has been established to meet this requirement. The Strategic Communications Command is responsible for development, installation and operation

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[6]U. S., Department of the Army, Office of the Chief of Staff of the Army, CSSSO-OP Letter, "Sentinel System Deployment Task Assignment-USAMC," October 4, 1968.

[7]U. S., Department of the Army, Office of the Chief of Staff of the Army, CSSSO-OP Letter, "Sentinel System Deployment Task Assignment-ARADCOM," October 4, 1968.

[8]U. S., Department of the Army, Office of the Chief of Staff of the Army, CSSSO-OP Letter, "Sentinel System Deployment Task Assignment-USCONARC," October 4, 1968.

[9]U. S., Department of the Army, Office of the Chief of Staff of the Army, CSSSO-OP Letter, "Sentinel System Deployment Task Assignment-Chief of Engineers," October 4, 1968.

of data links and voice communications within and between sites.[10] A special Safeguard agency, the Safeguard Communications Agency, has been established to provide this required support. The Advanced Ballistic Missile Defense Agency is responsible for providing advanced ballistic missile defense information for inclusion consideration in the Safeguard program.[11] A special agency, the Huntsville Office, has been established to perform this function. This special agency is also co-located with the Safeguard System Command.

Each of these major Army command special agencies must be integrated into a field management composite. The Safeguard System Command is responsible for this synthesization effort. The co-location of the Safeguard Logistics Command; the Huntsville Division, Corps of Engineers; and the Huntsville Office, Advanced Ballistic Missile Defense Agency; with the Safeguard System Command, reduces the effort in achieving a composite field management approach but does not alleviate all problems involved in integrating such diverse activities.

With the number of major Army Commands involved in the Safeguard program, it is evident that coordination and integration of both the policy and field management aspects of the program are of major concern. The Safeguard System Organization exists for the purpose of providing the required coordination and integration at both the policy and field manage- levels. Recognizing this mission for the Safeguard System Organization,

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[10]U. S., Department of the Army, Office of the Chief of Staff of the Army, CSSSO-OP Letter, "Sentinel System Deployment Task Assignment-USASTRATCOM," October 4, 1968.

[11]U. S., Department of the Army, Assistant Chief of Staff for Force Development, Letter Establishing the Advanced Ballistic Missile Defense Agency, March 1, 1968.

Figure 5 illustrates the interrelationships involved. The dotted line running from the major Army commands level to the Safeguard System Manager and Office reflects the coordination and integration exercised by the Safeguard System Manager for the policy level. The assignment of the System Manager to the Office of the Chief of Staff of the Army represents the centralized program focus that is reflected to the Department of the Army, Department of Defense and other comparable levels.

The dotted lines running from the specialized Safeguard agencies level to the Safeguard System Command reflects the field management coordination and integration of the program. The Safeguard System Command is responsible for the coordination and integration of the other field management organizations associated with the program.

To discharge this responsibility, the Safeguard System Command is organized into three functional directorates, one specialized directorate, four service type staff offices and nine support, or "housekeeping," type staff offices.[12] Figure 6 summarizes the Safeguard System Command formal organization structure.

The Research, Development, Test and Evaluation Directorate is responsible for research, test and development engineering on Safeguard components and the integrated Safeguard system. The Production and Logistics Directorate is responsible for production management, production engineering, quality engineering, production testing and production and stockpile reliability of the equipment of the approved program. The Site Activation Directorate is responsible for site selection and validation, monitoring of

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[12]U. S., Department of the Army, Safeguard System Command, SAFSCOM Regulation No. 10-1, "Organization and Management Manual," November 19, 1969.

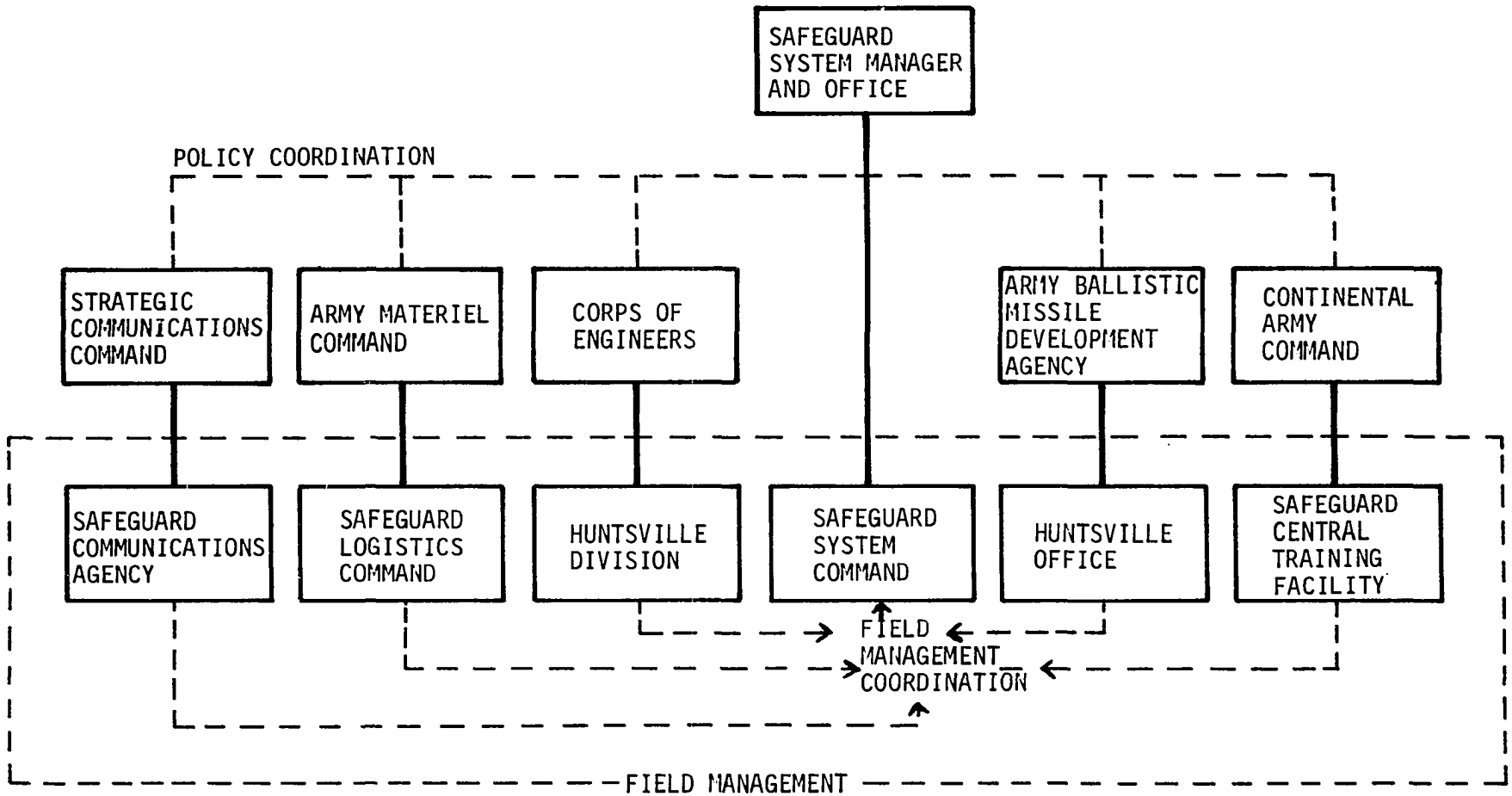


FIG. 5. --GOVERNMENT FIELD MANAGEMENT STRUCTURE

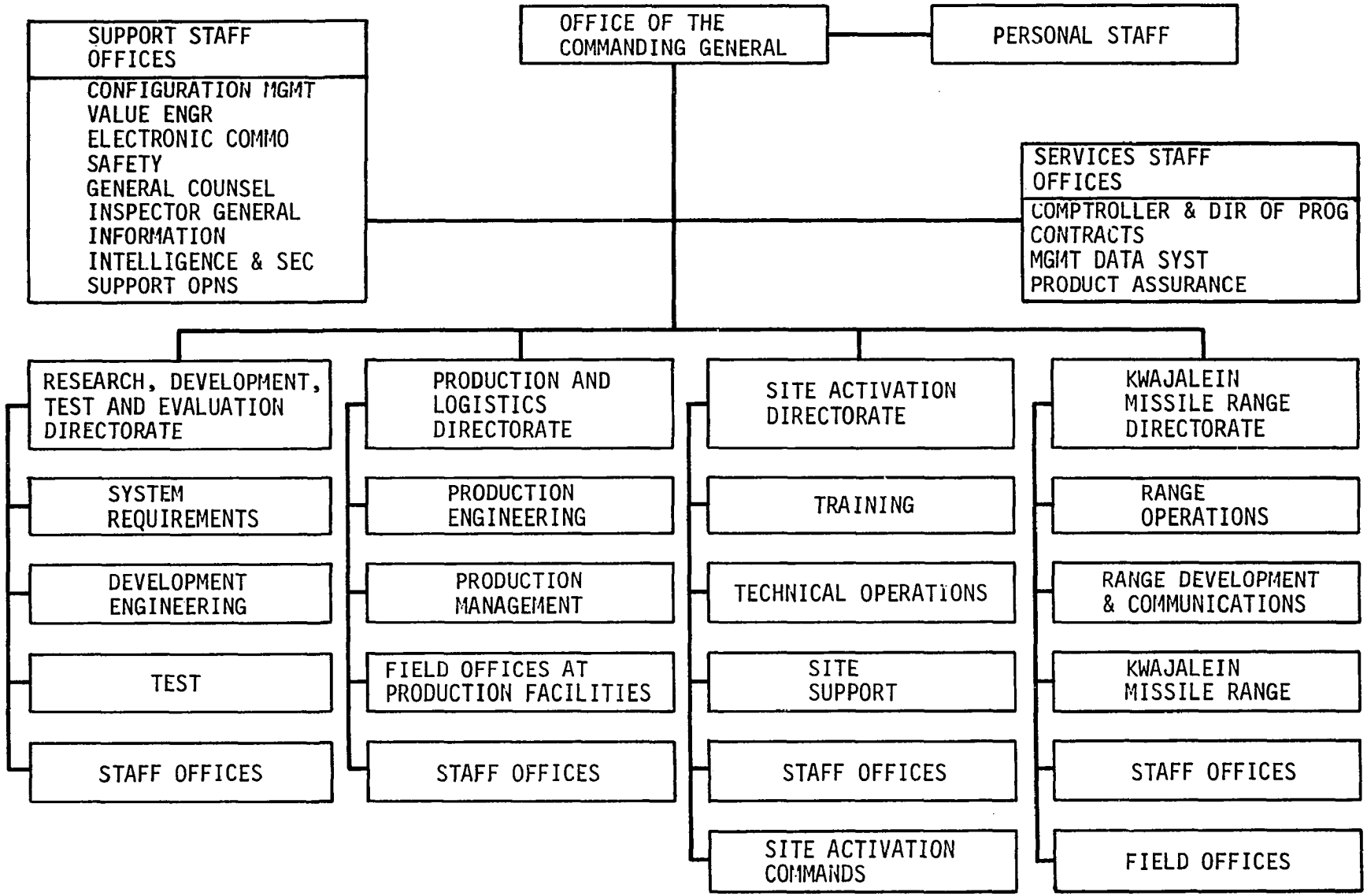


FIG. 6.--SAFEGUARD SYSTEM COMMAND ORGANIZATION STRUCTURE

Corps of Engineer construction activities, equipment installation, system test and validation of system performance at each Safeguard site. To provide the emphasis and control necessary at each site, the Site Activation Directorate will establish and control Site Activation Commands for each site. These Site Activation Commands will coordinate and integrate government and industry efforts directly associated with activation of particular sites.

The Kwajalein Range Directorate is responsible for the operation, control and maintenance of the research, development, test and evaluation activities at Kwajalein Missile Range in the Pacific Ocean. This is where most field testing of Safeguard subsystems and major assemblies is carried out. The Kwajalein Range Directorate is assigned to the Office of the Chief of Research and Development, Department of the Army, but is attached to the Safeguard System Command for administrative control. This arrangement is the result of a major share of the Kwajalein Range activities being associated with the Safeguard program.

The thirteen staff offices are grouped into service and support types. They provide to the Safeguard System Command, as well as selected support to the Safeguard System Organization, specialized and routine support and administrative services.

Each of the three functional directorates represents a particular phase in the life of the weapon system. The transfer of responsibility for equipment and activities from one phase to the next and the impact of activities in one phase on another futher illustrates the integration demands of the program.

An example of a transfer of responsibility from one phase to another illustrates the integrative concerns of government field management. The Research and Development Directorate is responsible for the design of the system equipment. This responsibility goes to the point of releasing a design package (drawings, specifications, etc.) to production. The Production and Logistics Directorate is responsible for production of the system equipment. They must use the design packages provided by the Research and Development Directorate for manufacturing of the equipment and assurance of the quality and reliability of the equipment. The Site Activation Directorate is responsible for installation of the equipment at a physical site and test of equipment installed. To do so, they must use the design packages for equipment integration and as bases for test of installed equipment. Such sequential phasing of responsibility is indicative of the interdependencies of responsibility involved in the government concept of field management.

The Safeguard System Command encompasses approximately one thousand military and civilian personnel. This number is small due to the government use of a concept of minimum commitment of dedicated organizational resources (both organization elements and personnel) necessary to achieve an acceptable level of effectiveness and efficiency in management of the program. Maximum use is made of existing personnel resources and organization elements and a minimum amount of dedicated Safeguard program special organizations are created.

The minimization of special Safeguard program organizations and dedicated personnel forces use of existing government organizations for accomplishing program objectives. The use of existing organizations

requires the delineation of participants program responsibilities in a different manner than that normally associated with responsibility assignments. The existing organizations have their own basic responsibility and the special Safeguard support responsibility as well. The establishment of special Safeguard field management elements within these existing organizations reduces the difficulty of emphasizing the Safeguard program. Their existance does not eliminate the competition between programs assigned to the organizations. The Safeguard System Organization is responsible for assuring that Safeguard Program emphisis is maintained within the environment of competing programs.

Industry Structure

Western Electric Company uses a project management concept as its basis for industry field management. The Western Electric Project Organization performs this project management function.

Figure 7 provides an overview of the general Western Electric Company organization design structure.[13] The concern of this study will be restricted, primarily, to the Defense Activities and Bell Telephone Laboratories portions of the general Western Electric Company organization design structure. Although the Bell Telephone Laboratories are a separate element in the American Telephone and Telegraph Company structure, the President, Western Electric Company, supervises Company interests in the Bell Telephone Laboratories as they pertain to the Safeguard program. As previously noted, the Bell Telephone Laboratories are included in any reference to Western Electric Company in this study.

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[13]Western Electric Company, "Charts on General Executive Organization," June 15, 1969.

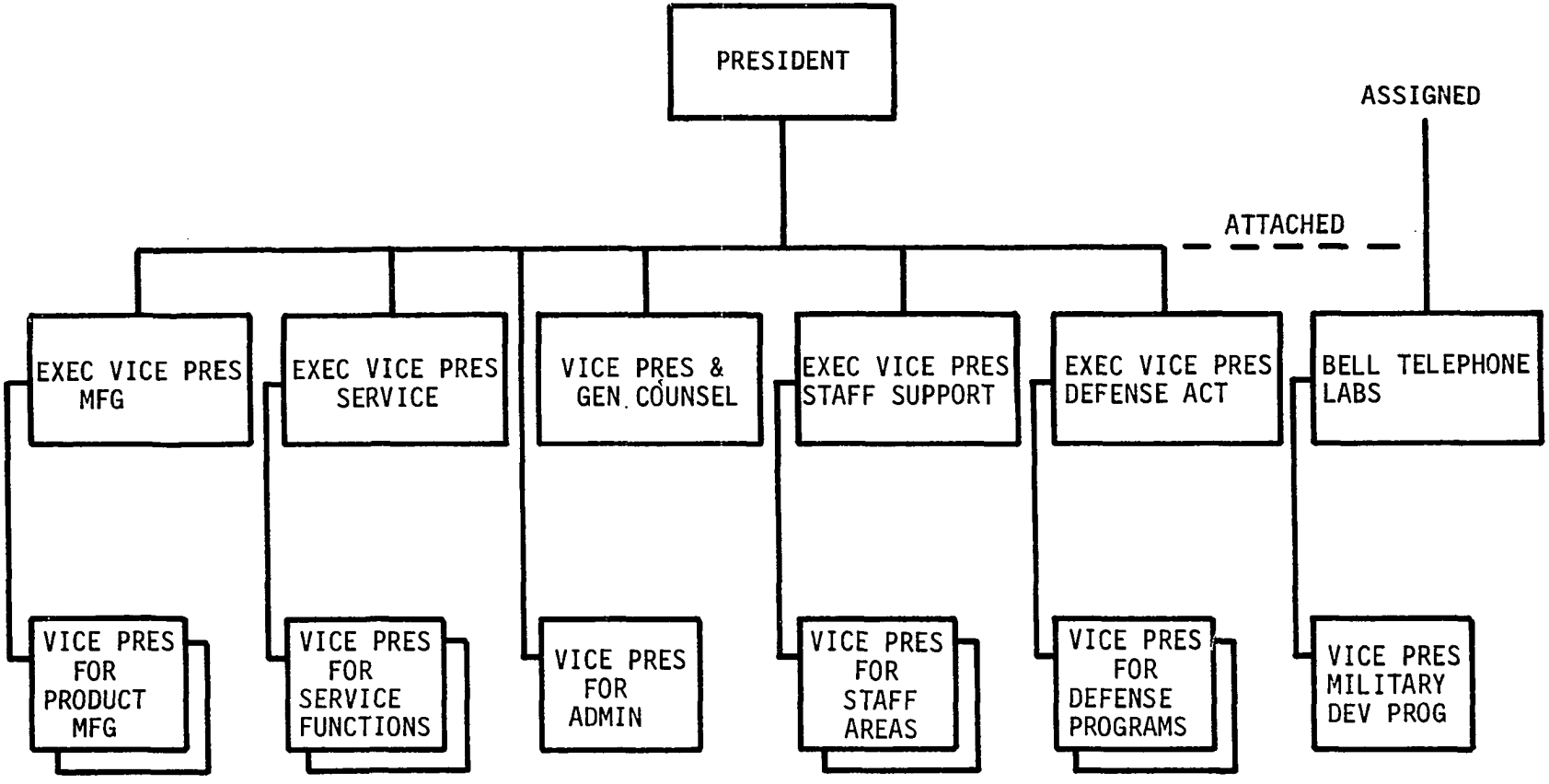


FIG. 7 .--WESTERN ELECTRIC COMPANY ORGANIZATION OVERVIEW

Figure 8 reflects the Safeguard program structure within the Defense Activities portion of the Western Electric Company.[14] The Executive Vice President for Defense Activities has overall industry responsibility for the Safeguard program. To discharge this responsibility, he uses two major organizational groupings. The first is the Western Electric Project Organization, the primary industry field management element, headed by a Vice President for the Safeguard System. The second grouping consists of selected Bell Telephone Laboratories elements, headed by a Vice President of Military Development Programs. These element are responsible for development and design of the Safeguard system and the providing of scientific support to the Western Electric Project Organization in the production and installation of the system equipment. The Bell Telephone Laboratories also serves as the design agency for the system.

Although there are two major groupings involved in the industry program efforts, attention is directed, basically, to the Western Electric Project Organization. This is due to the Western Electric Project Organization being the primary industry field management element and the lead program element of the Western Electric Company for the Safeguard program.

Figure 9 illustrates the general Western Electric Project Organization structure.[15] Organizational elements shown with a solid line are integral parts of the Western Electric Project Organization. Elements shown with a

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[14]Western Electric Company, Presentation at the Safeguard Executive Review Board Meeting, "Systems Analysis and Program Integration," May, 1969.

[15]Western Electric Company, Defense Activities, Organization Charts of Directors of Project Engineering and Operations, Systems Engineering and Project Control, Site Engineering and Operations, and Support Organizations, December 16, 1969.

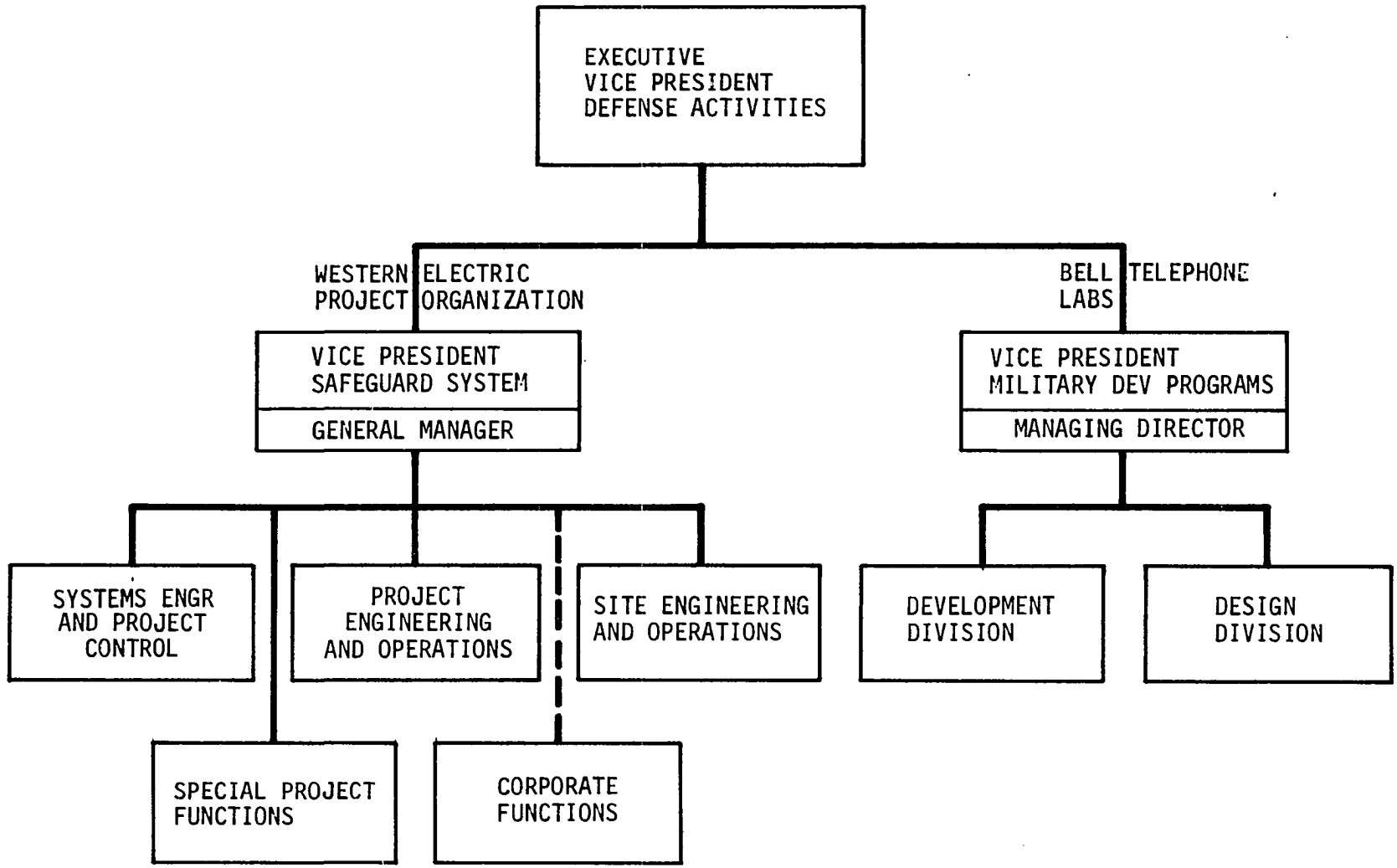


FIG. 8.--WESTERN ELECTRIC COMPANY SAFEGUARD PROJECT STRUCTURE

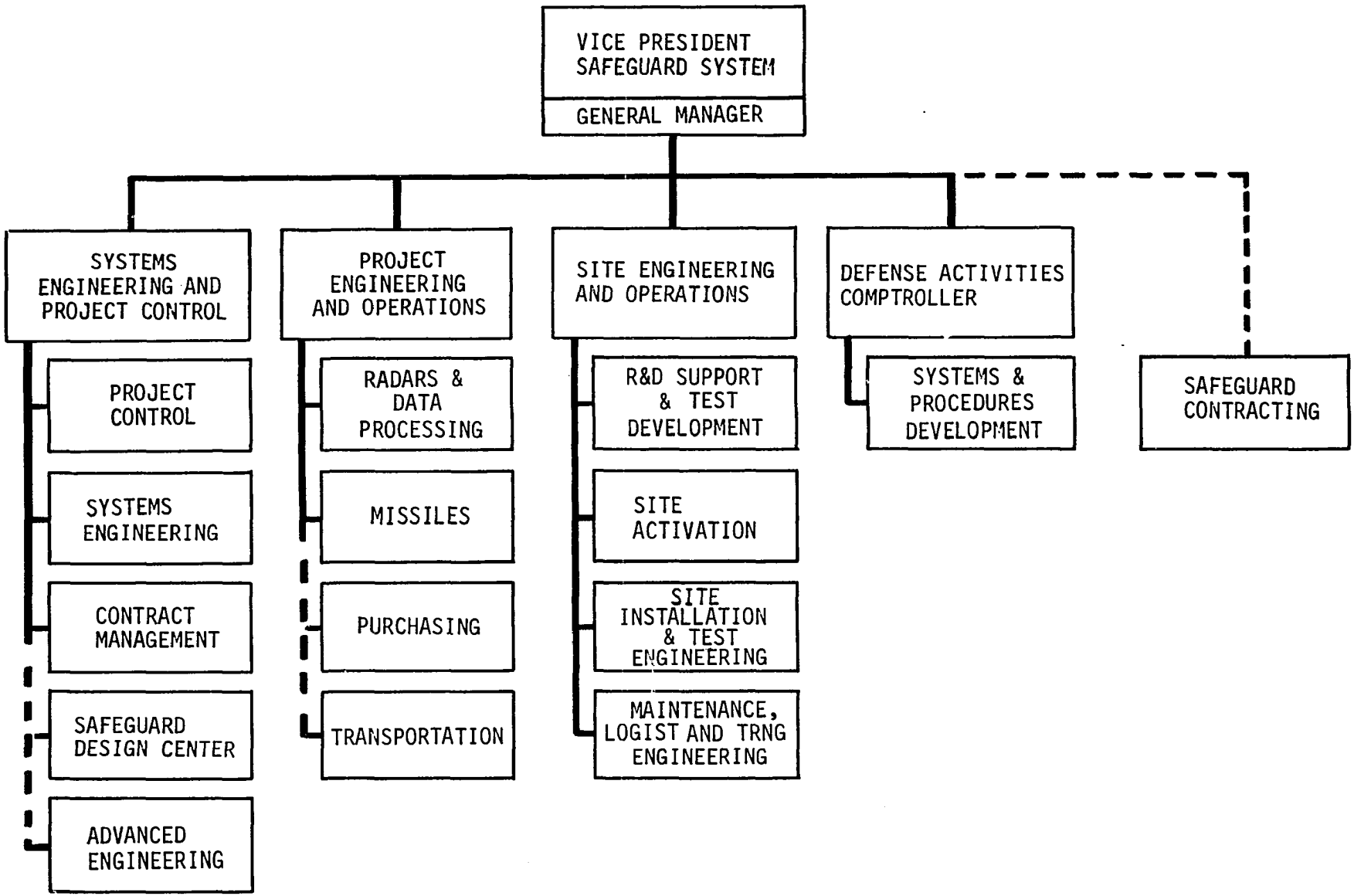


FIG. 9. --WESTERN ELECTRIC PROJECT ORGANIZATION STRUCTURE

dotted line are attached to the Western Electric Project Organization to provide support for the Safeguard program but are a formal part of some other company organizational element.

The Systems Engineering and Project Control element is responsible for integration of the overall industry program effort, both from the context of program integration (Project Control) and equipment integration (Systems Engineering). It is also responsible for industry management of the customer-supplier contractual arrangement (Contract Management) with the government and the Western Electric Project Organization coordination of the Bell Telephone Laboratories research and development and system design activities. (Safeguard Design Center)

The Project Engineering and Operations element is responsible for management of the industry efforts associated with hardware subsystems (Radars and Data Processing representing the Perimeter Acquisition Radar, Missile Site Radar and Data Processors; and Missiles representing the Spartan and Sprint missiles). It is also responsible for the coordination of the ancillary areas of purchasing supplies and services from subcontractors and vendors and the transportation of equipment from manufacturing locations to deployment sites and between manufacturing locations.

The Site Engineering and Operations element is responsible for development of equipment and system test criteria and procedures (Research and Development Support and Test Development) and the coordination of overall activities associated with activation of physical sites (Site Activation). It is also responsible for coordinating equipment installation at physical sites and testing of the installed equipment (Site Installation and Test Engineering). It is responsible for development of maintenance

procedures and requirements, providing logistical support and training requirements and instructions for operator and maintenance personnel (Maintenance, Logistics and Training Engineering). The Safeguard Contracting element is a Western Electric Company corporate level group attached to the Western Electric Project Organization to provide specialized contracting services such as negotiations, pricing and legal support, to the industry segment of the program.

It is apparent that the industry field management organization design structure is based on an orientation different than that used as the basis for the government organization design structure. The industry organization design is aligned to overview functions (such as Project Control and Systems Engineering), product groupings (such as Radars and Data Processing and Missiles) and service areas (such as Site Installation and Test Engineering and Maintenance, Logistics and Training Engineering). The government organization design is aligned to phases in the life of a weapons program (Research and Development, Production and Logistics, and Site Activation). Such differences in basic alignment of the organization design structures impedes the mutual interface of the two organizations and contributes to the need for program integration.

Government-Industry Interface

The management process for development of Army systems normally follows a life cycle phasing that involves concept formulation, contract definition, development and production, and operations and disposal.[16] These formal phases have distinct definitions and identified subphases.

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[16] U. S., Department of the Army, Army Regulation No. 11-25, "The Management Process for Development of Army Systems," (Washington: The Adjutant General, 1968).

Due to the evolutionary nature of the Safeguard system, it does not directly follow the standard system life cycle phases.

To understand the Safeguard program it is necessary to refer to more commonly used phases in the life of a weapon program. The commonly used phases are research, development, procurement, production, site activation and logistic support. Subsequent discussion will use these common phases grouped into arrangements of research and development, procurement and production, deployment (or site activation) and logistic support. These groupings generally correspond to the Safeguard System Command organization design structure and are commonly understood between government and industry field management.

The Safeguard program is presently in the research and development, procurement and production, deployment and logistic support planning phases, concurrently. The program involvement in multiple phases is the result of the concurrency of schedule that results from a complex system. Figure 10 illustrates the formal and common use phases of a system life cycle.

During the research and development phase, the government provides overall program direction, review and the definition of the threat for which the system is being designed to counter. During the production and deployment phases, the government provides overall program direction; evaluation and approval; and the definition of program requirements, deployment concepts and objectives.

During the research and development phase, industry responsibility is discharged through efforts of both the Bell Telephone Laboratories and the Western Electric Project Organization. The Bell Telephone Laboratories directs the development and design efforts and serves as the system design

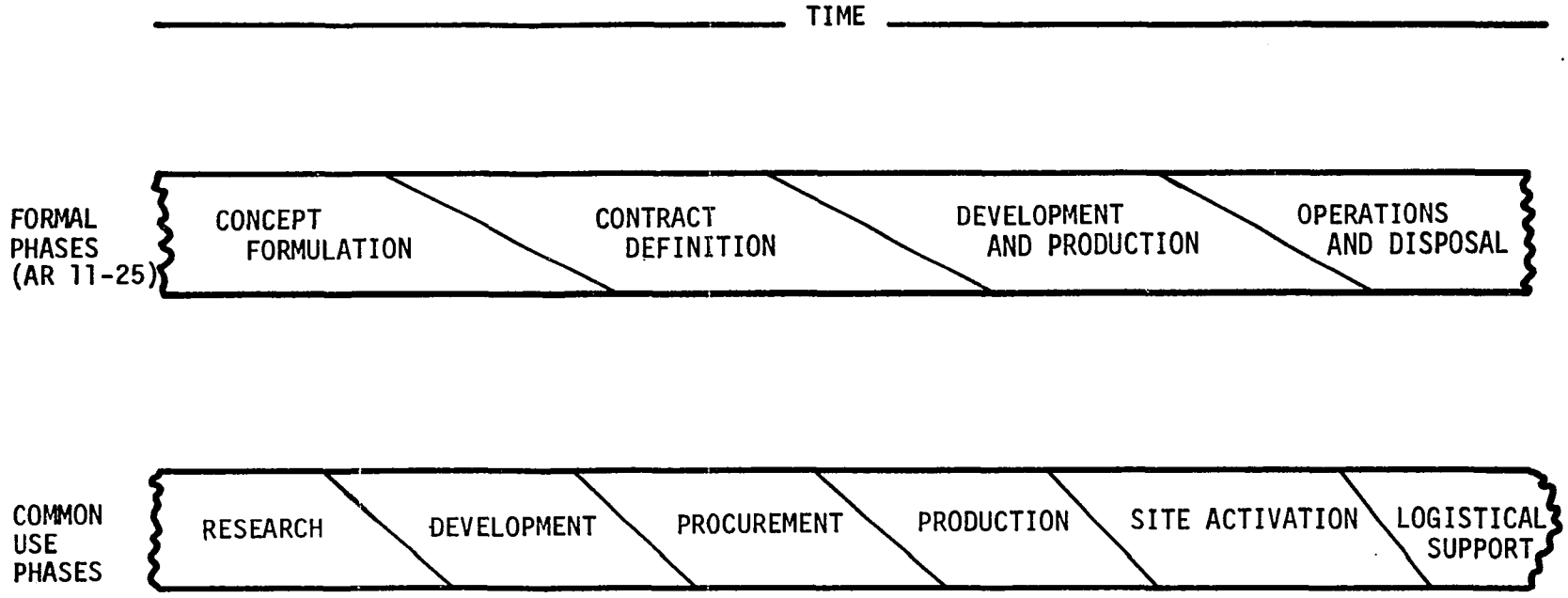


FIG. 10.--SYSTEM LIFE CYCLE PHASING

agency. The Western Electric Project Organization functions as the prime contractor. As the system design agency, Bell Telephone Laboratories is responsible for analysis of the threat, definition of system concept, development of system design and control of subcontractor design agencies.[17] The Western Electric Project Organization monitors the design for tactical application and provides engineering services and installation and test engineering support.

During the production and deployment phases, the Western Electric Project Organization provides program and systems analysis, systems engineering, system and program integration, program technical direction and project control of production, installation and test activities performed by elements of Western Electric Company and the other industry subcontractors. The Bell Telephone Laboratories provide design control, engineering support and technical assistance.

With such apparent differences in organization design structures, it seems pertinent to ask how the government and industry efforts are interfaced and how the overall program is integrated. The question of how the program is integrated will be discussed in Chapter III. The question of organization design interface is germane to the present discussion.

Government-industry organization design interface for the Safeguard program must be viewed from two levels, that of field management and that of policy formulation. From the viewpoint of field management, organization

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[17]Each subcontractor for an equipment subsystem has the design responsibility for the particular equipment subsystem but must operate within the limitations imposed by Western Electric Company as the prime contractor and the Bell Telephone Laboratories as the system design agency.

design interface plays a sensitive role in program accomplishment. The government-industry responsibility for implementation of the program and for its field management makes interface of the two organizations mandatory. From the viewpoint of policy formulation, government-industry interface is of less significance. This is due to the monistic nature of government responsibility for policy formulation. Industry's policy role is restricted to that of providing advice to the government.

Government-industry organization design interface is accomplished, primarily, between the Safeguard System Command and the Western Electric Project Organization. This does not mean that other government program participants have no field management interface with the Western Electric Project Organization. It does mean that all government program participant organizations interface with the Western Electric Project Organization either through the Safeguard System Command or in coordination with it. The Safeguard System Command performs the function of providing the central integrative point for government field management.

The discussion of government-industry interface has used the Western Electric Project Organization as the only industry element involved in field management interface. This results from the Western Electric Company having specifically designated the Western Electric Project Organization for central field management of all industry activities on the Safeguard program and the only industry organization for government program participants to interface with. The industry assignment of field management responsibility is more distinct than that of the government. This is partially the result of governmental emphasis on minimizing organizational resources to the program and emphasizing maximum utilization of existing resources.

In summary, the government-industry interface in field management of the Safeguard program occurs primarily between the Safeguard System Command and the Western Electric Project Organization and involves organizations with design structures that are incompatible for easy interface.

CHAPTER III

PROGRAM INTEGRATION

What It Is and Why It Is Necessary

Program integration is required in all complex governmental programs. It is not unique to defense weapon programs but becomes extremely critical in such programs. Program integration refers to a macro perspective, or an emphasis on the synthesization of pieces into a whole. In the Safeguard program, program integration means the concern for synthesization of system phases, product groupings, support and service areas, and organizational elements into a composite program.

Why is program integration a necessary concern in the Safeguard program? To answer this question, consideration of the major ingredients of the program and their magnitude provides a first illustration. The equipment and services for the program involves multi-thousands of industrial concerns (conservatively estimated to be in excess of ten thousand). Government program participants can be counted on a multi-score basis. With this large number of program participants, both government and industry, it is evident that a major emphasis on integration is mandatory. Program costs can be expressed in multi-billions of dollars, further supporting the necessity for program integration.

Development and deployment of the Safeguard system requires the integration of a wide spectrum of functions associated with the overall

defense system.[1] Examples of the range of functions involved can be seen in the "state-of-the-art" of research and development required for the program, construction of equipment and facilities for a nuclear environment, management of contractual arrangements that are measurable on a multi-billion dollar scale, and scheduling of the production and installation of multi-thousands of pieces of equipment required for a deployed system. These examples are compounded by the large number of industry and government program participants that must be integrated into a composite Safeguard program.

As an example of the mandatory requirement for program integration emphasis, activation of a Safeguard site can be considered. Numerous and diverse actions and events must happen during a concurrent time period. The site location must be selected, physically acquired and building and services required for the equipment and personnel constructed. The system equipment must be produced, tested and shipped to the site. This effort assumes that the required equipment has been designed and developed in sufficient time for the production of the equipment to have been possible.

The total Safeguard system is not designed and released for production as a complete design package. The overall system concept is established and equipment requirements specified at the initiation of the program. Actual design of equipment is dependent upon the time required for installation at the first site and the length of time necessary to produce and ship it. This approach means that the system is being designed, produced, installed and tested concurrently. Under such a

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[1] General William C. Westmoreland, Chief of Staff of the Army, Address to the Tennessee Valley Chapter, Association of the United States Army, Huntsville, Alabama, December 16, 1969.

concurrent arrangement it can easily be seen that a problem arising in one phase would have an adverse impact on other phases of the program.

Due to the size and complexity of the Safeguard program equipment, as well as the small number of sites involved, mass-production approaches are not necessarily applicable to some of the equipment. Most of the equipment assemblies will not be tested in relation to subsystems prior to installation at the tactical sites. This is different than the normal defense weapon program concept of testing the equipment as part of an operating subsystem and as part of a total tactical system. The Safeguard subsystems will not be tested until they are installed at the physical tactical sites due to their size and complexity. The description of equipment subsystems (Chapter I) reflected the physical size involved in the equipment, especially the radars. Utilization of such an approach does not mean that the equipment is not tested for design feasibility, operational standards and compatibility as a total operational system. Such testing is presently being done at the Safeguard research and development site at Kwajalein Missile Range. Utilization of this approach means that the equipment that will be used at a tactical site has not been tested at the system, subsystem and major assembly levels prior to its installation at the tactical site.

The equipment installation at a tactical site is spread over a lengthy period of time. Subassemblies and chassis pieces of equipment are shipped to the tactical site to meet a specific installation requirement date. This demands a closely phased schedule of many pieces of equipment that must be produced and shipped to meet the required installation dates. The production effort is, therefore, based on meeting the required dates

for tactical site installation and not for mass production of the total equipment requirements for the system. The production effort is further complicated by the annual reassessment and incremental authorization of the program. As noted in Chapter I, the initial authorization of Safeguard pertained to only two sites and the Fiscal Year 1971 administration proposal for the program was for one additional site and long lead-time authorization for five additional sites. Such "piece-meal" approvals preclude the use of standard contracting and production techniques. The production effort must be continually adjusted to provide the equipment required for approved program needs and at the same time remain capable of providing the equipment needed for subsequent increments of the program, assuming the subsequent increments will be approved during some future annual program reassessment.

Supportive of development, production, test and installation of equipment, are activities associated with the training of operational and maintenance personnel, development of data processing software (computer programs), provision of logistics requirements and similar type support efforts. These support area efforts occur during concurrent time periods and must be integrated with the equipment oriented efforts.

The preceding illustrations are indicative of the interrelatedness and interdependency of efforts involved in accomplishment of program objectives. Program integration is the concern for ensuring that all of these events and actions will happen when they should, how they should and as they should.

Government Concept

With the government use of a system management concept, it could be assumed that the system management organization would be aligned to achieve the integration requirements of the program. Such an assumption is true on a total Safeguard program basis but not necessarily true for field management of the program.

The Safeguard System Command, as the primary government field management organization, is functionally aligned in its organization design structure. The functional alignment is a triad of research and development, production and logistics, and site activation organizations. The Safeguard System Command functional alignment provides effective functional integration but less than optimum total field management integration.

The Research and Development Directorate functionally integrates research and development concerns through its own efforts; coordination of the Huntsville Office, Advanced Ballistic Missile Defense Agency; and primary government direction and control of the Bell Telephone Laboratories research, development and system design activities.

The Production and Logistics Directorate functionally integrates the areas of production and logistic support through its own efforts; coordinates the Safeguard Logistic Command contractor activities and provides the primary government interface with industry for production and logistics. This directorate does not functionally integrate the procurement area as is normally the case for a production organization. Functional integration of the procurement area is the responsibility of a staff office, the Contracts Office. This staff office is organized,

staffed and aligned to provide service and not to functionally manage a major area of the program.

The Site Activation Directorate functionally integrates the installation and site activation phases through its own efforts. It also coordinates the Huntsville Division, Corps of Engineers, and the Safeguard Central Training Facility; and provides the primary government interface with industry for installation and site activation activities.

By using a functional orientation in its organization design structure, one might assume that some organization design element of the government field management organization is responsible for integrating the separate functional areas into a composite whole. This is not the case with the Safeguard System Command. There is no identifiable organization design element with responsibility for integration of the total field management effort at less than the level of the Commanding General and his personal staff. The thirteen staff offices of the Safeguard System Command each have a distinct, and most often specialized, area of responsibility. The Comptroller and Director of Programs staff office is the nearest to such an overall program integration organization, yet the emphasis of this element is heavily oriented to financial and budgetary matters.

The composite field management program integration effort in the Safeguard System Command is "ad-hoc," or informal, in nature. Inter-directorate coordination, periodic Command and directorate reviews, special studies groups, "Task Forces," and personal coordination by the Commanding General and his personal staff are used as the basic techniques for achievement of composite program integration. The

organization design structure in government field management channels the program integration emphasis towards functional orientation but it does not provide an organization design element for overall integration at less than the level of the Commanding General and his personal staff.

Industry Concept

Western Electric Company's approach to field management program integration is significantly different than that of the Safeguard System Command. Functional orientation by program phase is not used in the industry approach as it is in the government approach. Industry's approach is based on:[2]

1. Identification and analysis of system product requirements.

2. Definition and evaluation of the functions and tasks required to accomplish program objectives.

3. Identification of interrelationships and interfaces required to accomplish program objectives.

4. Assignment and allocation of responsibilities for products, functions and tasks to organizations.

5. Establishment of a project organization to coordinate and integrate the activities of the program.

The industry alignment is heavily oriented to a product base. The product groups identified for the program are sites, equipment and material, computer software, communications, repair parts, operating and maintenance documentation, training aids and personnel training.[3]

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[2]Western Electric Company, Presentation at the Safeguard Executive Review Board Meeting, "Systems Analysis and Program Integration," May, 1969.

[3]Ibid.

The Project Control element of the Western Electric Project Organization is responsible for industry field management program integration.[4] Although structurally assigned to the Systems Engineering and Project Control organization, the Project Control element is responsible for program integration throughout the total of the Western Electric Project Organization. The Project Control element and the function of composite program integration are overlays superimposed on the industry organization design structure for field management. The clearly identifiable program integration element for industry and its overlay character are distinctively different than that of government field management organization design.

Although the industry organization design structure has a clearly identifiable element for composite program integration, its effectiveness in achieving integration is diluted by its emphasis on formality. Much of the element's efforts are devoted to the accumulation and presentation of masses of graphically portrayed information that is marginal in its usefulness relative to integration of the operational aspects of field management. Its effectiveness in achieving composite integration of the field management of the program is further diluted by its emphasis on integration of the efforts associated with satisfactory accomplishment of the formal contract requirements between the government and Western Electric Company. Such concern for accomplishment of the formal contractual requirements is understandable in relation to meeting the legal responsibilities imposed on Western Electric Company but does not

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[4]Western Electric Company, "Safeguard System Management Control System," January 16, 1970.

contribute to the accomplishment of integration of the joint government-industry field management efforts.

Government-Industry Composite

The Safeguard System Command and the Western Electric Project Organizations are the primary field management organization and have the principal responsibilities for field management integration. To discharge this responsibility, they must mutually interface in their organization design structures so that integration of field management is possible.

A cursory comparison of the organization design structure of the Safeguard System Command and the Western Electric Project Organization reveals a basic similarity between the two structures. Each has a hierarchial apex; Commanding General for the government and a Vice President for industry. Each has staff elements to provide service and support to the respective organizations, although the number of government staff offices far exceeds that of industry and are responsible directly to the Commanding General as compared to industry's assignment of most of their staff elements to one of the major operational elements. Each organization design structure has three major operating elements; Research and Development, Production and Logistics, and Site Activation Directorates for the government and Systems Engineering and Project Control, Project Engineering and Operations, and Site Engineering and Operations elements for industry.

If the respective organization design structures for field management are contrasted, Figure 11 is the result. Research and Development Directorate integration of its functional areas would require interface

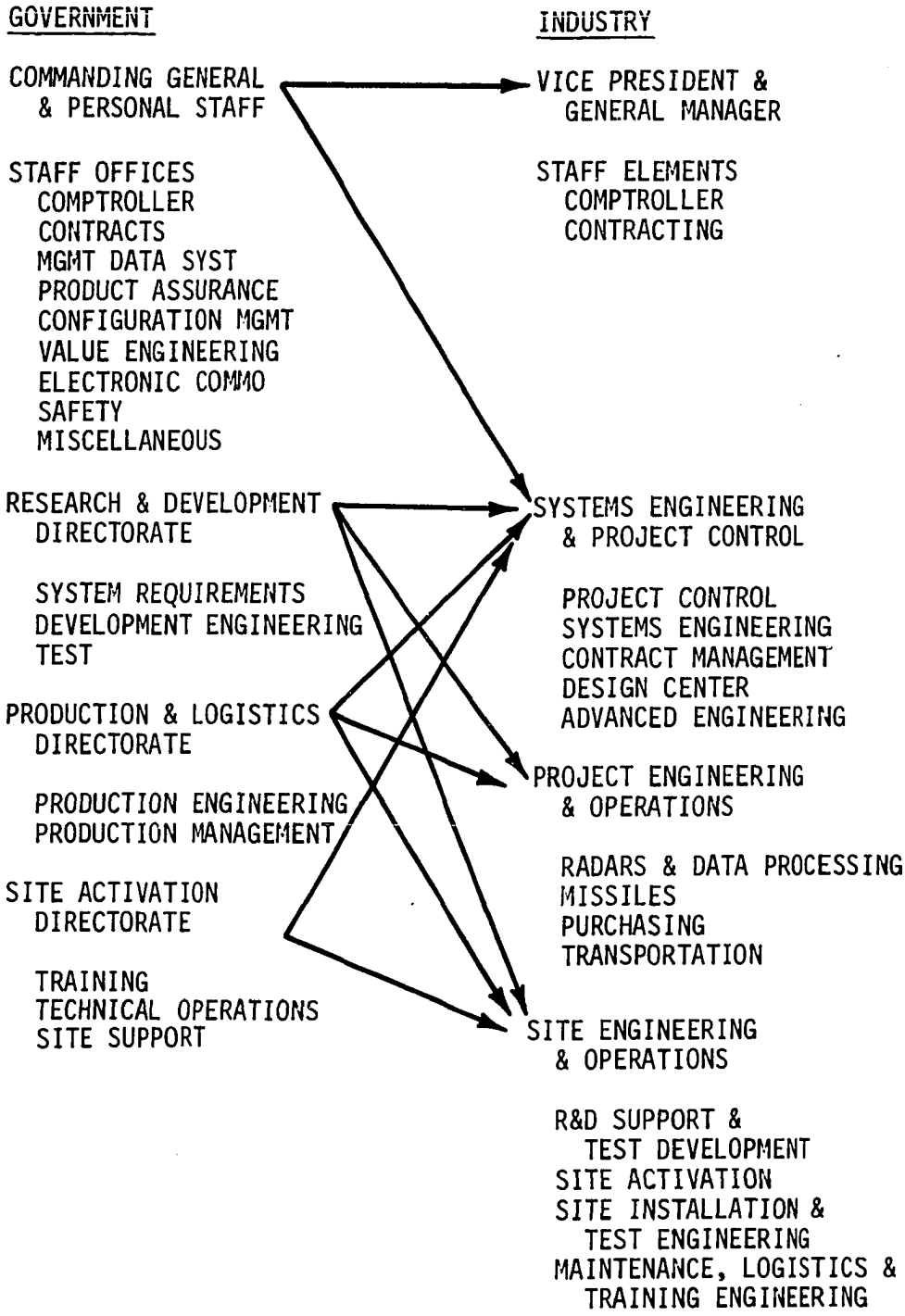


FIG. 11.--GOVERNMENT--INDUSTRY ORGANIZATION DESIGN, FUNCTIONAL INTERFACE

with the Site Engineering and Operations element for research and development support and test development; the Project Engineering and Operations element for hardware concerns; and the Systems Engineering and Project Control element for project control, systems engineering, contract management, design and advanced engineering.

Production and Logistics Directorate integration of its functional areas would require interface with Project Engineering and Operations for hardware production, Site Engineering and Operations for maintenance and logistics, and Systems Engineering and Project Control for all of its sub-areas. Site Activation Directorate integration of its functional areas would require interface with Site Engineering and Operations for site activation, site installation, test and training; and with Systems Engineering and Project Control for all of its sub-areas with the exception of design.

Staff offices aligned to special programs, or areas, such as product assurance, configuration management and value engineering, assist the Commanding General and his personal staff in performing the composite government program integration function for these particular specialized areas. This assistance is diluted by most of the government specialized areas having no direct correlatable industry organization design structure element within the three top levels of the industry organization design structure.

When the industry structure for field management is contrasted with the government structure, Figure 12 is the result. Without a detailed discussion, it is evident that the interfaces of this figure are different than those identified in Figure 11. The existance of two sets of

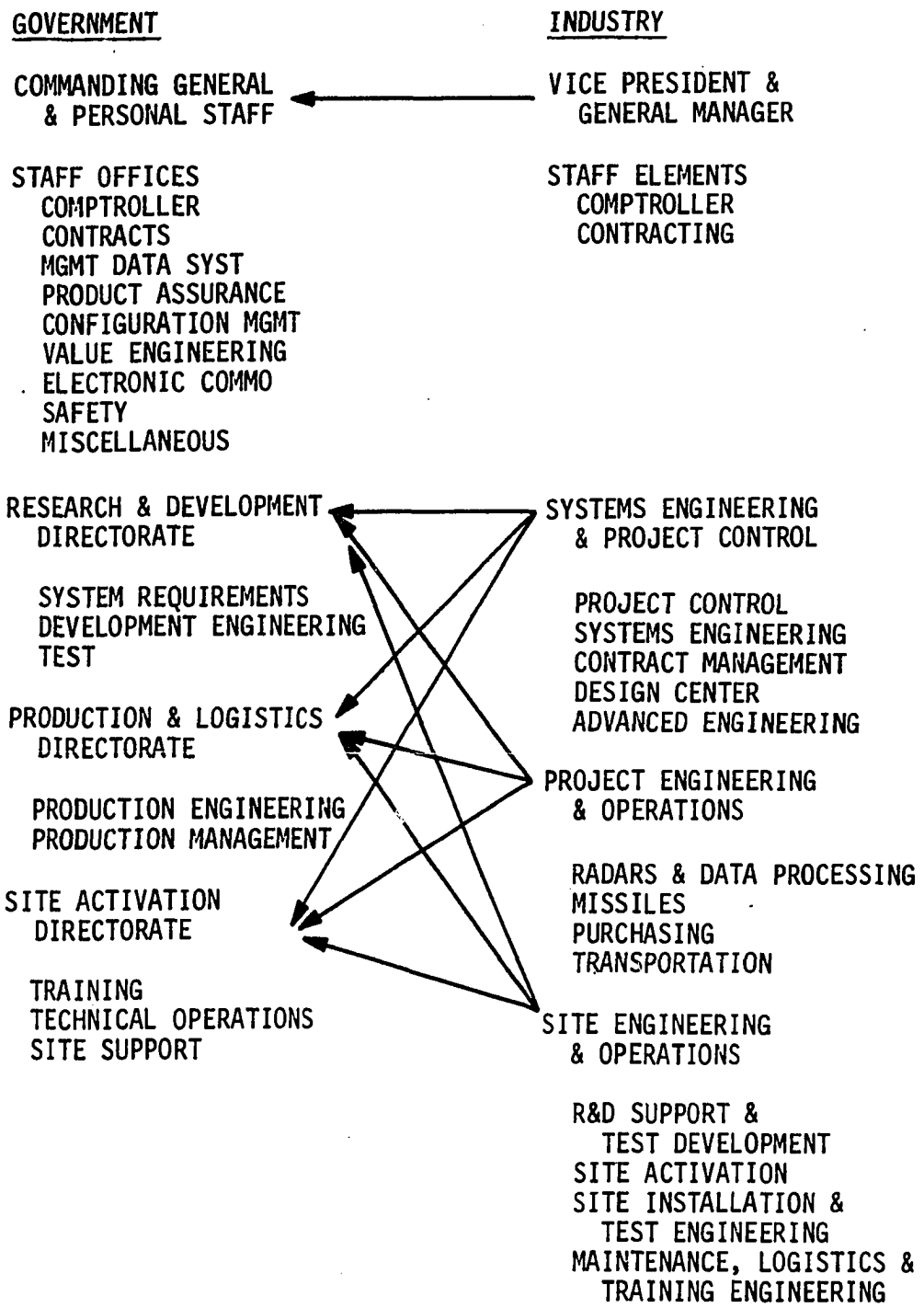


FIG. 12.--GOVERNMENT--INDUSTRY ORGANIZATION DESIGN. PRODUCT INTERFACE

organization design interfaces (as reflected by Figures 11 and 12) illustrates the difficulty of integrating the field management program.

The difference in basic orientation in the government and industry organization design structures results in unclear mutual interfaces. The absence of a clearly defined primary program integration element within the government results in the Commanding General and his personal staff having to function in a divided mode; partially as the hierarchial apex of the government field management organization and partially as the composite program integration element for government field management. The absence of a clearly defined government program integration element also dilutes the effectiveness of the industry integration element by denying it an interface point below the level of the Commanding General and his personal staff.

CHAPTER IV

ANALYTICAL FRAMEWORK

The preceding emphasis has focused on system and program orientations, formal government and industry organization design structures and the importance of program integration to field management of the Safeguard program. To assess the interrelationship of organization design and program integration in field management of this program so that the results are pertinent to the specific program and projectable to other similar programs, it is necessary to establish a theoretical reference framework for the more detailed subsequent analyses. Such a framework must be manageable in size.

The necessary limitation of scope can be accomplished by restricting the theoretical reference framework as follows:

1. The dependent variables are specified as organization design and program integration and will be further limited to their mutual interrelatedness relative to field management of the Safeguard program.

2. An open system model will be used for the subsequent analyses.

3. Independent variables selected for use in the model must meet the following criteria:

a. Pertinent to the interrelatedness of the two dependent variables.

b. Common elements in field management of the Safeguard program and common to other similar type programs.

c. Susceptible to manipulation in a system model.

Conceptual Model

The conceptual model must provide the capability of using ideas from multiple sources, theoretically sound, and capable of being operationalized. A system model provides such necessary flexibility. It is operationally bounded, yet conscious of external influences. It is structured, yet dynamic in the sense of a continual flow. It is a complete entity in itself, yet composed of lesser entities that are also complete in themselves.

Organization design represents the more structured and static aspects of the subject while program integration represents the fluid and dynamic aspects. The system model offers a relatively comparative structure for the non-structured elements that are critical to the identification and evaluation of the interrelationship of organization design and program integration in field management of the Safeguard program.

Figure 13 reflects the conceptual system model used in the study. The model generally parallels the system model concept used by Haberstroh.[1] There are inputs to the system, a conversion or transmission process, and output from the system. Feedback occurs in the system from output results

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[1]Chadwich J. Haberstroh, "Organization Design and Systems Analysis," in Handbook of Organizations, ed. by James G. March (Chicago: Rand McNally & Company, 1965), pp. 1171-1212.

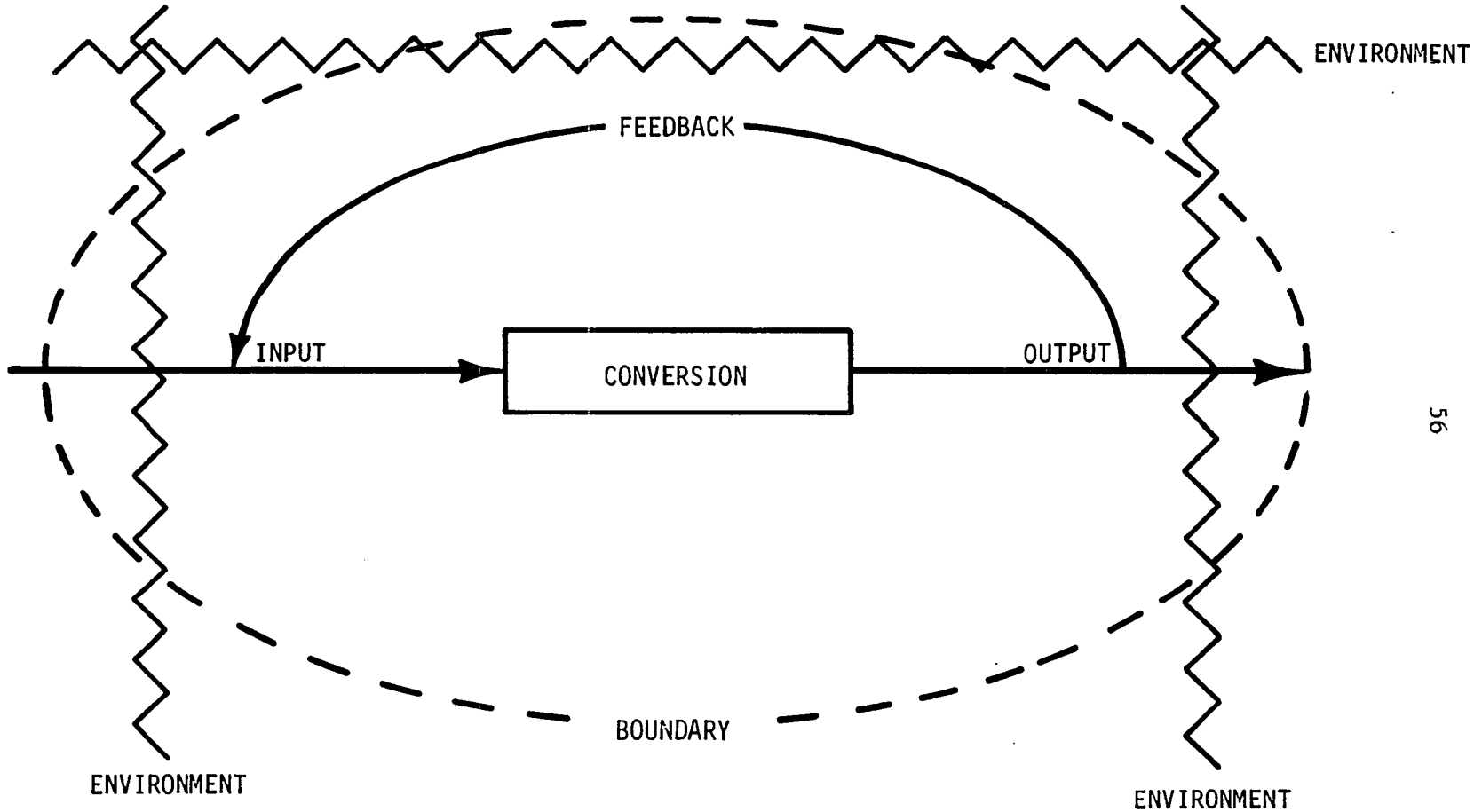


FIG. 13.--CONCEPTUAL MODEL

and the conversion process. Through feedback these results are channelled back to the input for system adjustment and stabilization. There is a conceptual boundary around the system to restrict its scope sufficiently to allow it to operate as an entity. The system operates within many different environments, each of which influences, and is influenced by, the system represented by the model. The system is also dynamic.

The conceptual model reflected in Figure 13 must be transposed to an operational, or applied, mode before it can be directly applicable to the prime concern of identifying and assessing the interrelationship of organization design and program integration in field management of the Safeguard program. The purpose of the subsequent section is the transposition from the conceptual to an operational system model.

Operational Model

Figure 14 portrays the operational model. The model is predictive in purpose. Its intent is to simulate the environmental dynamics and allow a symbolic manipulation of the variables selected.[2]

The attempt to operationally integrate diverse concepts that come from multiple sources is somewhat akin to the attempts to develop a universal religion or to formulate general principles of administration. Although possible utopian in idea, such an attempt is necessary if the broad context of integration is to be adequately addressed in an assessment of the interrelationship of two dependent variables. Faced with such a paradox, the critical concerns then become the selection of those diverse conceptual variables that are the most optimum in assessing the

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[2]Fremont A. Shull, Jr., "The Nature and Contribution of Administrative Models," Academy of Management Journal, V (August, 1962), pp. 124-138.

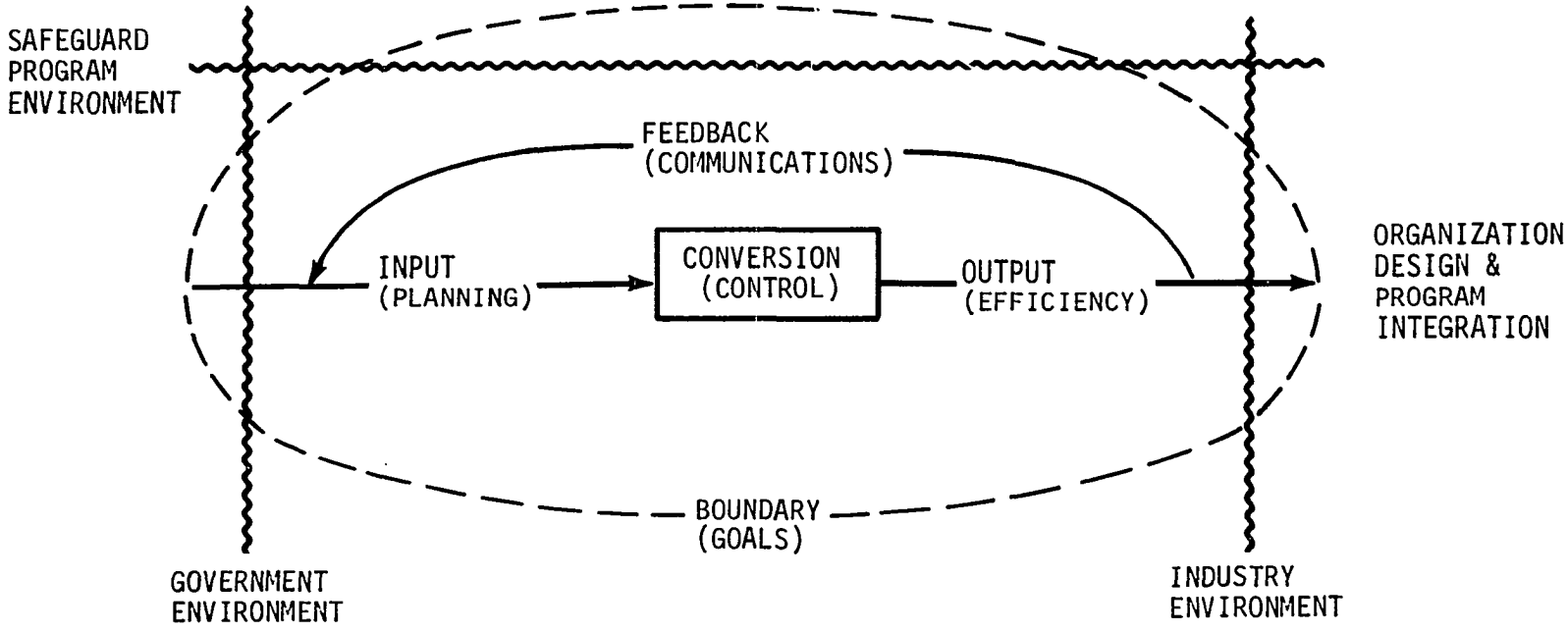


FIG. 14. --OPERATIONAL MODEL

interrelationship involved and the selection of those that are the least difficult to operationally synthesize.

From a more practical standpoint, the scope and complexity of many current programs and the conceptual ideas involved necessitates the operational integration, no matter how difficult the attempt, of diverse concepts to adequately reflect the case in point. If the attempt to integrate diverse concepts into a composite operational model is not made then any model developed is suspect of being parochial in relation to the particular study being attempted and not susceptible to projection of its results to the broad spectrum of similarities. Such would be the situation for this study if a single model, or a normally related set of variables, was used.

Assessment of the interrelationship of organization design and program integration in field management of the Safeguard program has a two-fold purpose. It assesses the interrelationship of the two dependent variables specially in Safeguard field management, but it does so for the purpose of attempting to determine the relative nature of such assessment results to the broad range of similar programs and situations. With such a two-fold purpose, the operational model must encompass attributes that tend to substantiate the applicability of results for consideration outside the realm of the immediate study situation.

Each of the independent variables selected to represent the conceptual model elements also represents a germane consideration in the administration of the Safeguard field management program. Each is a conceptual consideration that receives emphasis and priority in the program. Each is represented by major programs and organizational elements oriented to the understanding and accomplishment of the conceptual ideas.

The ultimate in a conceptual model intended for the assessment of the interrelationship of organization design and program integration in field management of the Safeguard program and subsequent projection of results for similar situation considerations would be the inclusion of all conceptual variables pertinent to the immediate study. Such an infinite number of variables would complicate the operational model to the extent that such a large number of possible interrelationships would be identified so as to dilute the application of the results. The expanded inclusion of diverse conceptual variables into an operational model appears pertinent to the understanding of interrelationships involved in the administration of complex programs and will be of continued interest to the author for subsequent research.

Attempting to assess and evaluate interrelationships in complex programs administration by means of commonly accepted conceptual representations is somewhat suspect. The credibility of the results of such assessments is influenced by the applicability of the conceptual representations employed to the general situation studied. It is somewhat like the employment of a specialist in a position that demands a generalist. The absence of attempts to integrate diverse conceptual variables into a composite model is indicative of the segmented and compartmentalized administration of complex programs and the situation whereby segments (conceptually) of a program are, in themselves, adequately understood but the program, as a total entity, seems to continually vibrate and convulse.

Planning is used as the input element of the system model. Ansoff's conception of planning as a practical, or applied, tool of administration

provides a structural context for planning as it is used in the operational model.[3] Use of this concept of planning is directly applicable to the Western Electric Company portion of the joint government-industry field management of the Safeguard program. This conception of planning must be mentally translated for applicability to the Safeguard System Command because its basis is that of the business firm. Although based on the business firm, the conception is relevant for visualization of planning in government activities, such as the Safeguard System Command.

This conception of planning visualizes the principal function of the organization to be the conversion of physical, human and financial resources into goods and services.[4] Use of a resources conversion function orientation is directly applicable to both the government and industry field management organizations of the Safeguard program. Each of these organizations is responsible for conversion of resources into goods and services. The output of goods and services resulting from the resources conversion function of the organizations are different for the two field management organizations. These differences are the results of the two organizations having different objectives, or goals.[5]

The concept of planning also allows a distinction to be made between strategic and operational planning.[6] Both the strategic and operational planning aspects are considered in the model. Which of the two planning

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[3]Igor Ansoff, "Planning as a Practical Management Tool," Financial Executive, XXXII (June, 1964), pp. 34-37.

[4]Ibid.

[5]The differences in government and industry field management organization goals are addressed in Chapter V.

[6]Ansoff, "Planning as a Practical Management Tool."

orientations is emphasized is one of the sensitive elements in the subsequent analyses of the interrelationship of organization design and program integration in field management of the Safeguard program.

The theoretical interrelatedness of planning, using the above concept, and goals indicated a general compatibility with another of the variables chosen for the model. The difference in the output of goods and services of the two field management organizations is also illustrative of a sensitive element (efficiency) that will be considered in the subsequent analyses, as well as the importance of program integration in mutually synthesizing diverse outputs and goals.

Planning is pertinent to the mutual interrelatedness of organization design and program integration. Such pertinence is illustrative by the organization design structure interface difficulties resulting from the different government and industry field management orientations and program integration approaches. Planning is a common element in the management of the Safeguard program, as well as common to other similar programs. Planning's susceptibility to manipulation in the system model appears to be supportable on the basis of its compatibility with the other variables selected to represent the operational model elements.

Other variables, such as rationality[7] and purpose factoring[8] are possible conceptual representations of the input variable of the system model. Neither is susceptible to manipulation in the operational model as readily as planning due to their incompatibility with the other

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[7]Herbert A. Simon, Administrative Behavior, (New York: The MacMillian Company, 1962), Chapter 4.

[8]Victor A. Thompson, Modern Organization (New York: Alfred A. Knopf, 1961), Chapter 2.

variables selected for use. Rationality and purpose factoring are also not common conceptions in the Safeguard program, nor in similar type programs, unless redefined or restructured radically.

Rationality is the concern with the selection of desired alternatives relative to some system of values that allows the consequences of alternatives to be evaluated.[9] As such, it is not susceptible to manipulation in a model using other variables such as goals, control, efficiency and communications. The difference between the values, based on goals, of the government and industry field management organizations prohibits the selection of a system of values mutually susceptible to alternative evaluation. Planning is a commonly used concept in Safeguard program field management, whereas rationality requires interpretation of a system of values from the myriad of practical program considerations.

Purpose factoring, or the factoring of general goals into successively lower and more specific subgoals until routinization or proceduralization is achieved, is not compatible in an operational model with the other elements used.[10] This is particularly true relative to use of goals to represent the boundary of the analytical model. Although the goals variable used in the operational model is aligned to organizational goals, the use of another variable in the model that is heavily dependent upon a goals concept would create unnecessary confusion.

Similar logical and operational elimination processes can be used for other possible input element conceptual representations. It appears irrelevant to express the bases for elimination of each possible conceptual

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[9] Simon, Administrative Behavior.

[10] Thompson, Modern Organization.

representation of an operational model variable, therefore, only the bases for the elimination of two possible substitutes is used in relation to each conceptual model element. Expanding the number of possible conceptual representations possible and the reasoning why they were not selected infers that all possible representations are known. Such is not the case.

The relevancy of planning to the organization design aspects of Safeguard field management is illustrative by the numerous considerations of planning in the narrative mission and function explanations of both the government[11] and industry[12] field management organizations. It is also illustrated by the emphasis placed on it in all aspects of complex program considerations and in academic study of organizations.

Control is used as the conceptual variable to represent the conversion process of the operational model. Control, as a concept, is used in many different ways. Many of the common conceptions are based on coercive foundations. These may range from the domination of one person by another to the aim of the organization being the ensurance that organization rules are obeyed and orders followed. The coercive based concepts of control are not compatible with the other variables selected to represent the operational model elements. To be compatible with the other variables, control must be conceptualized as near synonymous with coordination.

Litterer's concept of control closely approximates the conceptualization of control that is required for the operational model and as used

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[11] U.S., Department of the Army, Safeguard System Command, SAFSCOM Regulation No. 10-1, "Organization and Management Manual," November 19, 1969.

[12] Western Electric Company, Presentation at the Safeguard Executive Review Board Meeting, "Systems Analysis and Program Integration," May, 1969.

in the subsequent analyses.[13] In this concept, control is used in a cybernetic and non-coercive sense. It is concerned with both the events and activities directly related to achievement of major purposes, objectives and goals identified.[14] This concept recognizes that control and coordination are closely related and that their principles are similar.

This concept is based on a perception of control being a system in itself.[15] This allows a system perspective to be used in assessing the conversion process of the overall operational model. Both open and closed control loops are recognized, as are the distinct functions of sensor, discriminator and controller, or decision maker, and the recognition of time relationships that results in precontrol, current control and post control type of control practices.[16]

Control, as a system in itself or as a subsystem, is conducive to mutual assessment in relation with the other selected variables. The recognition of both open and closed control systems provides the basis for identifying sensitive elements in the subsequent analyses and provides two different perspectives for use in evaluation. Which control system, open or closed, used is indicative of both the organization design and of program integration. This is reflected in the policies and procedures used to implement the operational organization design and the program integration methodology required to implement the type of control system

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[13] Joseph A. Litterer, The Analysis of Organization (New York: John Wiley & Sons, Inc., 1965), pp. 233-255.

[14] Ibid.

[15] Ibid.

[16] Ibid.

employed by the organization. This situation will be pursued in more detail in Chapter VII.

Douglas Sherwin conceptualizes control as "action which adjusts operations to predetermined standards, and its basis is information in the hands of managers."[17] This concept of control is based on process control systems used in automated industries, such as the chemical and petroleum industries. It relates, basically, to the closed control system in the Litterer conceptualization of control.

Sherwin's approach to control emphasizes that objectives, plans, programs and organization design charts are neither control or means of control.[18] These elements are the predetermined standards that are used to adjust operations in the exercise of control. This distinction is of importance in evaluation of the interrelationship of organization design and program integration in field management of the Safeguard program. This distinction becomes one of the sensitive elements used in the subsequent analyses.

Edward Anthony conceptualizes control in a more practical sense and his conceptualization provides a mechanism for assistance in "bridging the gap" between the theoretical foundations of control and the practical aspects of control found in field management of the Safeguard program.[19] Although formulated for the purpose of communicating to small business

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[17]Douglas S. Sherwin, "The Meaning of Control," Dun's Review and Modern Industry, LXII (January, 1956), pp. 45-46, 83-84.

[18]Ibid.

[19]Edward L. Anthony, "Effective Control for Better Management," Management Aids for Small Manufacturers, No. 79. (Washington: Small Business Administration, 1957), pp. 1-4.

management, this concept of control is easily adaptable to large business activities, such as the Western Electric Project Organization, and to government organizations, such as the Safeguard System Command.

Anthony's concept specifies that control always involves the elements of goal, procedure and checkup.[20] One of these elements, goals, is the element selected to represent boundary in the operational model. The other two elements, procedure and checkup, are common to Safeguard program field management as well as to similar type programs.

Etzioni's conceptualization of control as being the distribution of means that an organization uses to obtain the performance it needs and to measure the actual performance versus the organizations' specification, partially fits the concept of control used in the operational model.[21] The distribution of means used by an organization to obtain the performance it needs is too coercive in orientation and is, therefore, not used in the operational model. The recognition of control involving the measurement of actual performance versus the organization's performance specification is germane. This portion of Etzioni's concept of control is supportive of the preceding concepts, as well as supportive of the composite conceptualization of control developed in Chapter VII.

Control, based on the preceding rationale, meets the three criteria for selecting independent variables, thus appropriate for use in representing conversion in the model.

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[20] Ibid.

[21] Amitai Etzioni, Modern Organizations, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964), Chapters 6 & 7.

Decision making[22] or cycle regulation[23] are possible concepts for representing the conversion process of the model but neither meets the three criteria for independent variable selection as well as control is able to do. This is primarily due to their incompatibility with the other operational model variables selected and their uncommonness to the Safeguard program and to similar programs without significant definitional change.

Decision making, in the sense of Simon's concern with deciding as an integral part of doing, is a common analytical concept.[24] Although common for use as an analytical concept, decision making would be difficult to apply to the evaluation of the interrelationship of organization design and program integration in field management of the Safeguard program. It would be difficult to convert from analytical concept to substantive condition. It would be even more difficult to restrict to only the conversion process of the overall model, as it is a major concern in the other operational model variables as well. Using control as concern with the events and activities directly related to achievement of major purposes and goals of an organization appears to encompass decision making as a part of such a concept.

Haberstroh's concept of cycle regulation is another possible candidate to represent the conversion process element of the operational model. This concept recognizes that most organization task models incorporate repetitively performed patterns of activities whose purpose

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[22]Simon, Administrative Behavior, Chapter 1.

[23]Haberstroh, Handbook of Organizations, pp. 1171-1172.

[24]Simon, Administrative Behavior.

are the achievement of organizational goals.[25] Each such cycle has a performance measure associated with it and psychological completeness for the human element involved, as well as operating at distinctively different levels of organization concern.[26] This concept can be incorporated into the general control concept as previously defined. Such incorporation is defensible especially in relation to the concern with maintenance of the organization so that it can function adequately to achieve purposes and goals.

Efficiency is used to represent output in the operational model. The concept of efficiency that is employed closely parallels the criterion of efficiency originally proposed by Simon.[27] Simon's criterion of efficiency required "the selection of that alternative, of all those available to the individual, which will yield the greatest net (money) return to the organization."[28] This concept is most applicable to commercial organizations, as Simon recognized.

With a small number of changes, this concept becomes susceptible to application in non-commercial organizations and integrative with the general concept of control. Simon devoted much effort to transposing the basic commercial organization applicability of the criterion to non-commercial application.[29] This effort of Simon is not used as the

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[25] Haberstroh, Handbook of Organizations.

[26] Ibid.

[27] C. E. Ridley and Herbert A. Simon, Measuring Municipal Activities, (Chicago, International City Managers' Association, 1938).

[28] Ibid.

[29] Simon, Administrative Behavior, Chapter 9.

explanation of the concept of efficiency relative to this model. A separate transition from the basic criterion is more applicable, using the original commercial orientation as the starting point. Obviously, the first change pertains to the net return aspect. Money measures are not appropriate for non-commercial organizations, or at least are not the primary return measure evaluations. They may not necessarily be the most appropriate for some commercial organizations. Western Electric Company's emphasis on company prestige and patriotic service to the government, at the expense of direct money profit, provides a possible illustration of such a situation.[30]

As a substitute for money returns, the concept of efficiency used in the operational model uses multiple returns. These multiple returns depend on the goals of the organizations involved and the external pressures exerted on the organizations that dictate which one, or few, of the returns is the most important to the organization. Congressional pressures on controlling costs and public pressure pertaining to nuclear safety at deployed sites are examples of external pressures on the government field management organization that demand flexibility of emphasis in the return bases used.

Another necessary change to the basic criterion pertains to the alternatives available from which the best alternative is selected. Consideration of all possible alternatives, in the selection of the best alternative, is not feasible. Whereas Simon's later refinement of the criterion of efficiency used satisficing in place of optimizing, the concept of efficiency used to represent output in the operational model

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[30]This situation is analyzed in detail in Chapter V.

employs the idea of selecting the best alternative from those alternatives evolving from the control system. The control system is concerned with the efforts directed toward achieving organization goals and maintenance of the organization so that is is oriented toward the achievement of such goals. From such goal orientations, filteration of alternative possibilities occur. Alternatives that pertain to the achievement of goals and maintenance of the organization are illuminated. The concept of efficiency used in the model uses these alternatives as the basis for selecting the best.

Each of the specified criteria for selecting independent variables is met by efficiency. Efficiency, like the other selected independent variable, is a common element in field management of the Safeguard program and in similar programs.

Compliance[31] or role orientation,[32] among others, are other possible concepts for use in representing the output element of the operational model. Neither meets all of the criteria for selection of independent variables as well as efficiency is able to do.

Compliance, as used by most authors, pertains to a coercive type of organization-human relationship. Etzioni is illustrative of the coercive emphasis on compliance. He defines compliance as the relation between the kind of power used to enforce control and the subordinates attitude toward that power.[33] Using such a perspective, Etzioni develops a

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[31] Amitai Etzioni, A Comparative Analysis of Complex Organizations, (New York: The Free Press, 1961), Chapter 1.

[32] Robert Presthus, The Organizational Society, (New York: Random House, 1962), Chapter 1.

[33] Etzioni, A Comparative Analysis of Complex Organizations.

classification of organizations based on the typical pattern of compliance of the subordinates to the kind of power used to enforce control.

Although Etzioni integrates compliance with control, especially in relation to the organizational control structures,[34] the coercive basis of compliance he uses precludes its use in representing the output element of the operational model. Even though much of the government field management effort involves power based control systems, a significant amount of effort does not. Informal, or "ad-hoc," control systems evolve outside the official government hierarchical organization design without the use of coercive power. The same is true for a portion of the industry efforts. Even though the government development and production contract for the Safeguard program contains voluminous specifications and requirements, the scope and complexity of the program and its control requirements defy contractual coverage of all possible, or even probable, needs. Although not contractually covered, these pertinent government-industry control needs are usually given attention through informal, non-direct power based, means.

Communications is the concept selected to represent the feedback element of the operational model. The basic Shannon model of communications is the foundation upon which communications, as a representation of feedback is the system model, is based.[35] This model uses four basic elements. The first element is the sender, or that person or event that produces a message and inserts it into the communications system of the

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[34]Amitai Etzioni, "Organizational Control Structure," in Handbook of Organizations, ed. by James G. March (Chicago: Rand McNally & Company, 1965), pp. 650-677.

[35]C. Shannon and W. Weaver, The Mathematical Theory of Communications (Urbana, Ill.: University of Illinois Press, 1949).

organization. The second element is the channel, or the method of conveyance of the message between the sender and the receiver. The receiver is the third element of the communications system, either as the intended recipient of the message or an accidental recipient as the result of diffusion from the channel. Noise, or anything in the channel other than the message wanted by the sender, is the fourth element of the communications system.

This general model of communications provides a sound theoretical base for feedback as well as transition to the applied context of Safeguard program field management and the interrelationship of organization design and program integration. The communications network that represents the combination of the four elements of the general model into a working model, enables a differentation to be made between particular communications systems. If the communications network is aligned to the formal organization structure, the hierarchical chain of command or a legitimized source of power, it is considered as a formal communications system. If it does not meet either of these criteria, it is considered as an informal communications system. The existence and significance of formal communications systems in either the government or industry field management organizations, or between them, is one of the sensitive considerations in the subsequent analyses.

Due to one of the major functions of feedback in a system model being that of providing the means of internal regulation of the entire model, when the model is viewed in a dynamic sense, communications offers a good conceptual variable representation. Communications, in the four element context previously outlined, provides for the means of regulating,

either by overt instigation or conditioned response, the composite of the total operational model.

Dyanmics (i.e., growth and development)[36] or assessment,[37] as well as other concepts are possible candidates to represent the feedback element of the operational model. They are unable to meet the previously specified criteria for selecting independent variables as well as communications is able to do.

Starbuck's conception of organization growth and development, or dynamics, is not conducive as a representational framework for feedback, due to the constraining nature of the definitions of growth and development used in the concept. Growth is viewed by Starbuck as change in size relative to membership in the organization and development as change relative to an organization's age.[38] Neither of these definitions would be responsive in an environment of frequent organization activations, expansions, contractions and de-activations resulting from use of systems and project management concepts, such as those used in the Safeguard program. The dynamics of government organizations associated with defense weapon programs and industry organizations supporting such programs, far exceed such sterile and moot definitions.

Goals is the independent variable selected to represent boundry in the operational model. Initial consideration of such ideas as mission,

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[36]William H. Starbuck, "Organizational Growth and Development," in Handbook of Organizations, ed. by James G. March (Chicago: Rank McNally & Company, 1965), pp. 451-533.

[37]James D. Thompson, Organizations in Action, (New York: McGraw-Hill Company, 1967), Chapter 7.

[38]Starbuck, Handbook of Organizations.

function, products, projects, etc., as boundary representational concepts, resulted in a decision that a broad definition of goals would encompass all such ideas.

Goals will be defined as the composite organization's operational objectives. They are composite in the sense of being acceptable as operational objectives of both the organization itself and the members of the organization. They are operational in the sense of reflecting attainable ends of the organization and its members. Deployment of a specified weapon configuration by a certain date is considered as an operational objective for government, whereas the defense of the United States against enemy launched Intercontinental Ballistic Missiles is not. The attainment and retention of a specified percentage of profit on a certain annual dollar amount is an operational objective of industry, whereas the attainment of maximum profit is not.

Goals, as the operational objectives of the composite organization, provides a partially identifiable surface around the program and organizations involved in the analyses. It is also permeable to the extent that external environmental influences are received and responded to. The operational objectives of the Safeguard System Command and the Western Electric Project Organization provides the enclosing sphere within which field management of the program is accomplished and within which the interrelationship of organization design and program integration must be viewed and analyzed. The enclosing nature of the operational objectives provides a boundary within which the operational model must operate and upon which external environmental influences must be identified, evaluated and included or rejected in the operational model assessment.

To make the operational model completely open in nature, it would be necessary to take into account the influences of all possible environments in which the system exists. This would not be feasible, therefore, a quasi-open system concept is used. The general environments of government, industry and the overall Safeguard program are recognized and considered. The remainder of the environmental possibilities are generally excluded.

Influences of the government, industry and overall Safeguard program environments are significant. This is the result of the specific influences each has on field management, as well as on the other operational model variables and on the model as a conceptual entity.

The governmental environment influences the model by such considerations as:

1. A standardized approach to organization design possibilities available in structuring field management organizations is used. This results from the government emphasis on using similar organization design structures among the many defense weapon programs. Such an emphasis on likeness of organization designs means that the organization design for management of a complex missile system must fit, generally, an organization design used for management of an armored vehicle or infantry support weapon. Fitting of unlike programs to similar organization designs contributes to the problem of integration of complex programs.

2. Government adherence to an official human resources rank and grade structure within the Safeguard field management organizations exists. The rank structure of the military personnel and the grade structure of the civilian personnel involved in field management

illustrates this situation. Such a rank and grade structure inhibits the amont of flexibility available in field management.

3. A high degree of sensitivity to pressure external to the program structure exists. Examples such as the particular national administration, Congress and political pressure groups are illustrative of this situation.

The industry environment influences the model in such areas as:

1. Difference in goal emphasis of the industry sector as compared with the government sector. Industry's emphasis is aligned to the Safeguard program as one of numerous commercial and defense programs of the Western Electric Company whereas the government's emphasis is aligned to the Safeguard program as the basic program the Safeguard System Command is responsible for.

2. Difference in industry perspective resulting from the supplier, or dependent, nature of industry as compared with the customer, or independent, nature of government. This is reflected in the contractual arrangement between government and industry that is used to obtain industry program participation.

3. The mandatory nature of Western Electric Company "Company Instructions" used for common subject areas in the Safeguard program and throughout the company results in standardizing of program integration approaches and techniques. These "Company Instructions" impose stereotyped methods and techniques in relation to how things are done irregardless of the particular program or situation.

The overall Safeguard program environment influences the model in such areas as:

1. Change in the international political arena and the system's place in that arena. If the international political environment is oriented to arms expansion, the Safeguard program is heavily emphasized. Conversely, if the international political environment is oriented to arms limitation, the program receives less emphasis. The current Strategic Arms Limitation Talks (SALT) is illustrative of this program influence.

2. Significance of the program in the overall national defense posture. If there are alternative weapon systems available to accomplish the purpose of the subject system, the importance of the one system is reduced. In the case of the Safeguard program, no other ballistic missile defense system is near the point of deployment; therefore, Safeguard must be considered in the context of being the only system available for ballistic missile defense. This increases the critical dependence upon the program and reduces the competitive balance attainable from multiple programs.

Rationale for Model

The operational model is obviously general in nature and macro in orientation, thus an explanation of the rationale of its development and its pertinence to the subject at hand appears appropriate. Why is a composite macro model necessary when many micro models already exist and single concept macro models abound? What use can be made of such a composite macro model and what should it not be used for? Who would use such a model and who would not? What is the relationship between the model developed and the subsequent detailed analyses that are also

conceptual elements of the macro model? What is the bases upon which the model is constructed and what degree of validity should be expected from its use? What is the purpose and use of the subsequent individual conceptual sub-models? What is the relationship between the model developed and the assessment of the interrelationship of organization design and program integration in field management of the Safeguard program? Answers to these questions are the purposes of this section.

The question of why a composite macro model has to be constructed appears answerable in relation to the following considerations:

1. Most of the existing macro models are based on use of one conceptual representation. The objective of this study is to determine the interrelationship of organization design and program integration in field management of the Safeguard program. The concept of program integration, in itself, represents a multi-concept perspective. To assess it in relation to organization design necessitates use of multi-concepts synthesized into a composite mechanism for use in evaluation. A composite macro model appears to provide such a mechanism.

2. Although many micro models exist that adequately pertain to specific concerns addressed in this study, the use of micro considerations is segmenting in orientation. With the concept of program integration important to the subject under study and basically synthesizing in its orientation, use of micro models would detract from the broad integration emphasis of the perspective desired.

3. Many of the existing macro models are based on the assessment of a single agency program. Obviously, the Safeguard program and its field management is not a single agency program. Chapters II

and III illustrate the multi-agency nature of the program and the sensitivity of integration of the many agencies to achieve effective program field management.

The operational model is intended for use by top levels of management in both government and industry to provide a perspective for viewing the complexities and ramifications of large complex programs. It should provide such top level managers with a perspective that insures the composite integration of many diverse concepts that such programs must contend with. It should provide a reference framework within which more concrete macro models can be assessed and an infrastructure upon which micro (in the sense of functional areas, special sub-programs, etc.) concerns can be built and have a reasonable degree of validity in relation to their inter-dependencies and interrelatedness.

The model is not intended for the handling of actual data nor for the development of sub-models that will handle actual data. Use of the model for such purposes negates the integrated conceptual perspective it is intended to reflect and moves it from its intended level of conceptual abstractness to the level of concreteness associated with micro areas of concern.

Such a model should provide program directors, project managers, senior staff specialists and similar program management positions with an integrated conceptual framework that provides a perspective mechanism for handling the multi-facets of many current programs that are large and complex. It is not intended as a useable assessment framework for operating middle managers responsible for distinct segments of a program. Its conceptual scope exceeds that pertinent to such levels of management.

The operational model is obviously abstract and macro in its orientation. The conceptual representations used to portray the model elements are also abstract and macro, although to a lesser degree than the basic model. The conceptual representations used to represent the operational model elements are also models in themselves. They are useable not only as elements of the operational model but also as conceptual perspectives for the areas of concern they portray. The subsequent analyses are based on using the separate conceptual representation models for assessing the interrelationship of organization design and program integration in field management of the Safeguard program. Although individual conceptual representational models are used individually in the subsequent analyses, the interrelatedness and interdependency of each in relation to each other and to the general operational model is recognized and synthesization attempted.

The individual element models should be useable by senior management levels responsible for the broad areas of a program represented by the concepts. If the program is structured such that the conceptual elements of the operational model are not considered to be separate program areas in themselves, two alternatives appear available. One alternative would be to relate the conceptual areas to the program structure elements, or vice versa, to the extent feasible. The second alternative would be for the program structure elements to use the perspective of the general operational model for the particular program segment they are responsible for.

The second alternative appears feasible for both the government and industry aspects of Safeguard program field management. Neither government

nor industry structures their field management program along the lines of the operational model conceptual representations. The government program structure is aligned to functional areas (research and development, procurement and production, site activation and logistical support) representing phases in the life cycle of a weapon system. Industry's program structure is aligned to product areas (Project Engineering and Operations and Site Engineering and Operations) and an integration aspect (Project Control and Systems Engineering).

Although neither element structure its program along the lines of the concepts used to represent elements in the operational model, both appear conducive to use of the operational model and its conceptual elements. The conceptual representations of the operational model are generally considered to be processes in both the government and industry field management schemes. As such, they play important roles in accomplishing the field management program and cross standard program structure elements. Crossing of the standard program structure elements reinforces the need to assess the field management program from the perspective of synthesization necessary to integrate processes and program structure elements.

The program structure elements of both government and industry field management appear conducive to use of not only the separate conceptual submodels but also the general operational model. The functional government program areas and the product and integration areas of industry can be perceived as sub-programs. From such a perspective, the concepts of goals, planning, control, efficiency and communications and their interrelatedness appear pertinent to the production aspects of a program or to the site engineering and operations aspects of a program.

In summary, the rationale flow for the model is:

1. Operational model based on conceptual representations as model elements.

2. Operational model intended for use by top levels of management as an integrative perspective framework.

3. Conceptual element models providing a framework for inclusion of concrete micro considerations.

4. Conceptual element models portraying critical processes in government and industry field management.

5. Conceptual element models intended for use in assessing elements of the operational model or providing a perspective framework of less abstractness than the operational model.

6. Neither the operational nor the separate conceptual models are susceptible to operation or validation by use of concrete data. All are intended as conceptual perspective frameworks.

A logical question appears to be what validity can be attached to the model and to the selection of the conceptual representations used as model elements. The preceding section established certain "groundrules" that concepts had to meet before they were selected for inclusion in the operational model. As noted above, the conceptual representations selected represent critical processes in both government and industry field management. The use of a semi-open system approach to the operational model dictated that certain concepts fit certain elements of the system structure. A combination of such concerns tempered by the experience of the author resulted in the development of the operational model and the selection of the conceptual representations used to portray its elements.

The theoretical nature of the model and its abstractness precludes definitive validation. The results derived from the subsequent analyses appear to support its general validity for the purposes intended. Its ultimate test will be its application to similar programs and situations and the relevancy of the inferances and indications resulting from such applications.

CHAPTER V

GOALS[1]

Before assessing the impact of goals on the interrelationship of organization design and program integration in Safeguard field management, it is necessary to delineate the particular context of goals to be used in this analysis. The first delineation must be made between the goals of the individual members of an organization and the goals of the organization itself. This study is primarily concerned with the goals of the organization.

Gross's approach to organizational purpose will be used as the basic concept for the assessment of goals.[2] Gross categorizes goals relative to satisfaction of clientele interests, output of goods and services, performance criteria used, orientation of organizational resources investment emphasis, mobilization of organizational resources, observance of codes and type of rationality emphasized. Use of such categorizations provides a mechanism for assessing the following considerations:

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[1] Goals, objectives and purposes are used synonymously in this chapter and in all subsequent analyses.

[2] Bertran M. Gross, Organizations and Their Managing, (New York: The Free Press, 1964), Chapter 11.

1. The officially stated goals of an organization may not match the practical goals of the organization. This appears to be the results of operational necessities and the theoretical nature of formally stated organization goals.

2. Organizations have a multiplicity of goals and such goals are continually changing in priority of emphasis.

3. A conceptual framework is available for use in an evaluative scheme of Safeguard field management. From such a framework, operational goals can be identified and their relative priority established.

Government-Industry Similarities and Differences

Identification of program or organization goals within the government framework is exceedingly difficult. Goals are not normally definitively stated, nor are they developed specifically as goals, or objectives. A synthesis of program purpose and organization mission provides the best indication of goals that is available in government programs. The purposes of a particular program are outlined as a part of the approval process of the program. Each organizational element, as part of its organization and management scheme, specifies the general mission of the organization and of its subelements. The composite of that portion of program purposes for which the organization is responsible and the mission of the organization itself will represent goals in the concept used in this assessment.

The purpose of the Safeguard program and the mission of the Safeguard System Manager should provide an indication of the goals of the Safeguard System Organization. This composite should be indicative of the Safeguard program goals at the policy level as well as for the overall Safeguard program.

The objectives of the initial deployment of the Safeguard system were outlined in Chapter I. The mission of the Safeguard System Manager is to develop and assure the timely, effective deployment of the Safeguard system and to provide a single point of contact within the Department of the Army for the coordination and direction of all activities pertaining to the Safeguard system.[3] The Safeguard System Office provides assistance to the System Manager in the exercise of his (System Manager) responsibily.[4] The Safeguard System Evaluation Agency's mission is to provide a single organization for performing evaluation of the system, independent of the Safeguard System Command and the Safeguard contractor organization.[5] This independent agency is for the purpose of enabling the performance of testing that will support an independent evaluation program responsive to user requirements.[6] The Safeguard System Command is responsible for accomplishing the development, acquisition and installation of the approved Safeguard system within the guidance and direction of the Safeguard System Manager.[7]

If the preceding objectives are synthesized with the responsibilities and missions of the Safeguard System Manager, Safeguard System Office, Safeguard System Evaluation Agency and the Safeguard System Command,

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[3]U. S., Department of the Army, Office of the Chief of Staff of the Army, Safeguard System Master Plan, Volume No. I, "Safeguard Basic Objectives," undated.

[4]Ibid.

[5]Ibid.

[6]Ibid.

[7]Ibid.

somewhat definitive statements become available in relation to the composite goals of the program and organizations involved.

The goals of the Safeguard program have been continually dynamic in an operational sense. The formal, or static, goals, as outlined by President Nixon's announcement of his decision to deploy the system, are stable. The implementation of these static goals by transposition to operational goals is an environment of continual change and adjustment. This dynamic nature of the operational program objectives is a result of numerous factors. Some of the major influencing factors are the annual program reassessment, incremental method of program authorization, changes to the threat base, continual change in the state of technology used in system equipment development and continual need to adjust the projected system costs.

Annual program reassessment requires a program to be both a total program and an open-option for subsequent program changes. It is a total program in the sense of becoming an operating system entity as a result of each annual reassessment. The program approved as a result of the annual reassessment has to be considered as a possible final system program. Annual reassessments require that the prior approved program retain an open-option capability so that changes resulting from subsequent reassessments can be incorporated into the overall program with minimized impact on costs, schedules, performance, contractual arrangements and organizational resources needs.

Incremental program authorization and the attendant appropriations process prohibits comprehensive alignment to the theoretical total program needs. Contractual arrangements with industry must be structured in such

a manner that approved program requirements are procured in consonance with program authorization received as well as approved and anticipated program needs. Such a paradoxical situation precludes use of optimizing approaches to contracting, planning, organizational resources utilization and similar concerns.

The threat base against which the system is designed is also dynamic. As the ballistic missile threat changes, certain aspects of the system equipment configuration, equipment design criteria and deployment methodology must also be changed. These changes must be integrated into both the currently approved program and the projected total program.

The Safeguard system requires a level of technology that uses the most modern "state-of-the-art" available. As theoretical and applied research develops new technological advancements, the system must be adjusted to consider the use of such new technology. Any application requires program adjustment for inclusion.

Actual and projected program costs play a major role in the operational objectives of the field management organizations as a result of the high cost of the Safeguard program and previous experience with defense weapon system cost escalation. This situation is further compounded by the current overall government emphasis on economy and austerity in relation to defense programs.

The development and production lead-times of the system equipment and the advance nature of the technology involved contributes to the difficulty of accurately estimating program costs. Due to the complexity of the equipment involved and the advanced nature of technology employed, a high degree of concurrency exists in relation to the development and

production aspects of the program. Major pieces of equipment cannot be designed and tested before they are released for production of the equipment necessary to achieve a deployed defense site by the time required. The length of time necessary to develop major equipment subsystems coupled with the time necessary to produce such equipment is excessive in relation to the need for such equipment to combat a known or anticipated threat.

To alleviate the excessive timeframe that would result from sequential phasing of development and production, a system of concurrent effort is employed. This concurrent process involves the development of pieces of equipment and their subsequent release to production. Such an incremental method results in a segmented orientation to both the development and production programs. Integration emphasis occurs only when the incremental pieces of equipment are shipped to the tactical site for final installation and test.

Incremental program authorizations normally specify a maximum funding figure and a definitive system configuration. Both the policy and field management levels of government and industry must be concerned with providing the specified system configuration within the program funding limitation imposed. The reconciliation of these two boundaries necessitates "trade-offs" that require a dynamic perspective relative to program and organization objectives, or goals.

The goals of the government field management program and organization can only be arrived at by use of the same circular type of deductive reasoning as that used for the overall Safeguard program. The purposes of the overall Safeguard program pertains to government field management

goals within the limitations imposed by the assignment of program responsibilities to the Safeguard System Command.[8] The mission of this Command, as previously noted, is to accomplish the development, acquisition and installation of the approved Safeguard system. This responsibility is to be carried out through operating (functional) directorates, with support and services provided by Command staff offices.[9]

Operationally susceptible government field management goals, as well as program goals, can be arrived at only through deductive factoring and interpretation of operational activities.

Industry's goals in relation to the Safeguard program and its field management also have to be identified by less than direct means. One method is to identify what industry feels its program responsibilities to be, identify what the government, as customer, feels industry's responsibilities are and then synthesize the two viewpoints into a composite perspective. This method is employed in the identification of industry operational goals. Western Electric Company's company wide goals are assumed to be standard business goals unrelated to the Safeguard program and, therefore, are not of direct concern to this study.

The government's views of industry's field management responsibilities in the Safeguard program are:[10]

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[8]U. S., Department of the Army, General Order 48, November 15, 1968, as amended by Department of the Army, General Order 18, March 15, 1969.

[9]Safeguard Managers' Meeting, Winston-Salem, North Carolina, February 17-18, 1970.

[10]Ibid.

1. Western Electric Company, as weapon system prime contractor for production, installation and test, has responsibility for system integrity for all system elements produced.

2. Bell Telephone Laboratories, as principal design agency, is responsible for overall system design and control of subcontractor design efforts.

Industry views its responsibilities in field management of the Safeguard program to be:[11]

1. During the research and development phase:

a. Western Electric Project Organization monitoring of the system design for tactical application and the providing of engineering services, installation and test engineering support.

b. Bell Telephone Laboratories providing the threat analysis, definition of system concept, development of system design and project control of subcontractor design agencies.

2. During the production and deployment phase:

a. Western Electric Project Organization providing program and system analysis, systems engineering and integration, overall technical direction and project control of the production, installation and test activities performed by Western Electric Company and its subcontractors.

b. Bell Telephone Laboratories to provide design and documentation control, engineering support and technical assistance.

Purposes, responsibilities, missions and views, such as those reflected in preceding paragraphs for both government and industry, are

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[11]Western Electric Company, Presentation at the Safeguard Executive Review Board Meeting, "System Analysis and Program Integration," May, 1969.

not conducive to assessment, in an operational sense, of the interrelationship of organization design and program integration in field management of the Safeguard program. To operationalize the goals of the government and industry field management organizations necessitates the interpretative deduction of operational, or applied, activities. The interpretative deductions must use the generalized previous statements of purpose, missions and responsibilities as a reference framework for their formulation. Gross's categorization of organization goals, or purposes, provides a reference framework for use in the subsequent analyses.

Figure 15 illustrates an analytical scheme from which similarities and differences in government and industry field management organization goals can be deduced. The goals reflected are not the officially stated goals of the industry and government organizations but are representative of the operational goals actually pursued by the two field management organizations. The goals shown encompass the more significant operational objectives identifiable from program purposes and organizational missions.

Bases for the satisfaction of interests, in terms of the orientation of interests to major groups or pressures, is multiple based for both government and industry. Some of the bases for the satisfaction of interests are similar, while others differ. Program pride and prestige is one basis for the satisfaction of interests that is common to both organizations.

At the field management level, program pride and prestige is reflected in the disassociation, basically, of the Safeguard System Command from the other Army missile system management organizations in

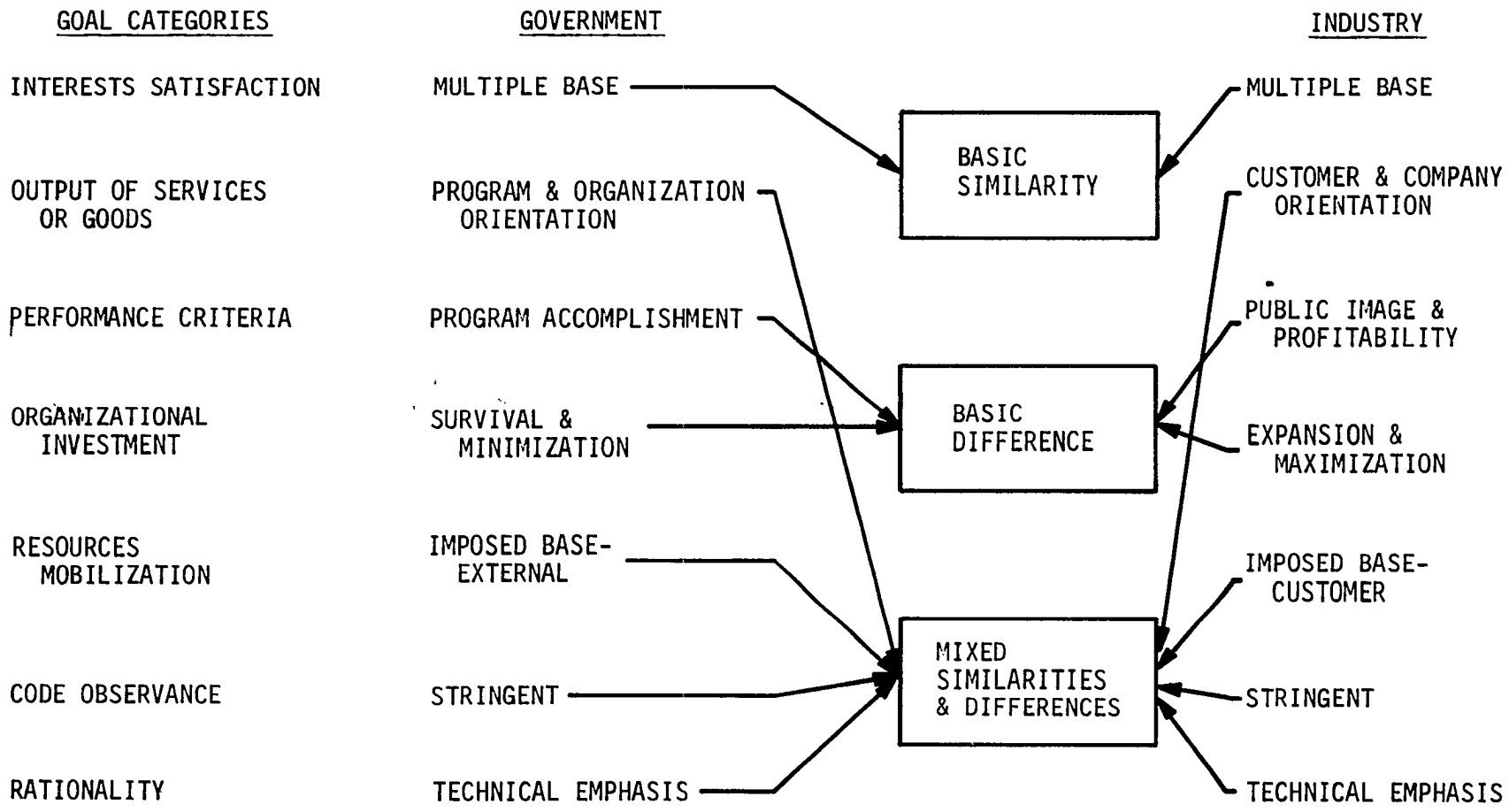


FIG. 15.--GOVERNMENT--INDUSTRY ORGANIZATION GOALS COMPARISON

the Huntsville, Alabama, area. Redstone Arsenal is a large Department of the Army installation contigious to Huntsville. The Army Missile Command and the Army Missile and Munitions Center and School are both physically located on Redstone Arsenal. The first is a field element of the Army Material Command and the latter is a field element of the Continental Army Command. The Safeguard System Command is physically located in a leased, privately owned, complex in the Huntsville Research Park area. The Safeguard Logistics Command; the Huntsville Division, Corps of Engineers; and the Huntsville Office, Advanced Ballistic Missile Defense Agency, are also located in the leased complex and not on Redstone Arsenal itself.

A similar location situation is evolving from the Western Electric Project Organization. At the present time it occupies portions of two buildings in downtown Greensboro, North Carolina, whose basic purpose is to house the Western Electric Company, North Carolina Works. A new building is under construction in the Greensboro area that will be fully dedicated to housing the Western Electric Company Safeguard program elements.

The actual segregation of the Safeguard program field management elements from the other Army missile elements in the Huntsville area and the planned segregation of the industry Safeguard program elements in the Greensboro area are indicative of the prestige the program enjoys in both the government and industry sectors. Program prestige is further illustrated by the "hand-picked" nature of most of the employees of both the government and industry field management organizations. The government personnel are selected on the basis of either their prior association

with the evolutionary anti-ballistic missile development programs, their association with other defense weapon program management organizations or with industrial concerns aligned to industry support of complex defense weapon programs.

Industry field management personnel are selected on the bais of either their prior association with the Western Electric Company efforts on anti-ballistic missile development programs or selectively chosen from Western Electric Company commercial programs. Due to the vast increase in the commitment of new personnel resulting from the decision to deploy the Safeguard system, a large segment of their (industry's) Safeguard program organization is staffed with personnel who have commercial program backgrounds. Western Electric Company's philosophy used in management of defense weapon programs is based primarily on the use of existing Western Electric Company personnel and not mass recruitment from the aerospace-military sector as many defense weapon program contractors do.

External group satisfaction is another illustration of the multiple based satisfaction of interests exhibited by the two organizations and is also illustrative of a satisfaction of interests alignment that is different between the two organizations. The Western Electric Company, as the parent corporation, and the major program subcontractors denote the type of external groups that must be satisfied in the Western Electric Project Organization goals array. Western Electric Company has certain company wide interests, such as conservative levels of profit and retention of the company's image of itself of performing a public service when it engages in industry support of defense weapon programs. These company wide interests must be satisfied in field management of the Safeguard program.

With the industry program subcontractors being industrial concerns such as Raytheon, General Electric, Martin and McDonnell-Douglas, it is obvious that the Western Electric Project Organization must insure a level of efficiency in its industry integration activities that is aligned to the stature and experience of such participating companies. Each of the major subcontractors either is, or was, the prime contractor for one or more major defense weapon programs. With such experience, their expectations of the Western Electric Company's management achievement for the Safeguard program works as a catalyst to the Western Electric Company. The major subcontractor situation is further complicated by the subcontractors inability, formally, to deal directly with the government field management organizations. The prime-subcontract arrangement for the program requires a legal channel of government--Western Electric Company--subcontractor and the reverse.

The output of services or goods category of organizational goals reflects a partial similarity between the two organizations, i.e., government alignment to program accomplishment and industry to satisfaction of customer requirements. There are distinct differences in other output of goods and services orientations. For example, a secondary orientation of government is to organizational survival, or self-preservation. This is a neutral, protective type of orientation that appears prevalent in most organizations.

The organizational survival orientation of the government field management organization is seen in the creation and retention of efforts whose basic purpose is support of the organization and not of program requirements and needs. Such an orientation is considered normal when

it is based on one program, or mission, as in the case of the government field management organization.

A secondary industry orientation is to company prestige, a more positive type of orientation. Western Electric Company has an image of itself as a stable, conservative example of traditional American industry. Such a self image influences its methods and the ways in which it interfaces with the government. The company openly expresses a belief that it is performing a patriotic service to the government by performing the prime contractor role in the Safeguard program.

The performance criteria category of goals reflects a basic difference between the government and industry field management organizations. The government performance criteria is based on program accomplishment, as would be expected when the sole purpose of the organization is to accomplish a specific program. The performance criteria of efficiency is a valid consideration in government field management, but is applicable only as it relates to support of program accomplishment. An emphasis on program accomplishment as the basic criteria of efficiency contributes to a basic purpose, but precludes use of dynamic and innovative approaches. Such an emphasis results in saturation type applications and the use of commonly accepted techniques.

Industry's performance criteria is based on public image retention and conservative profit making, which are distinctively different than the government emphasis on program accomplishment. An industry performance criteria based on profitability is expected. If it is secondary, as is the case of Western Electric Company in the Safeguard program, it is somewhat unique. Maintenance of the company's perception of its

public image is clearly more important to the Western Electric Company relative to the Safeguard program than that of open profits.

The company program outlook is one of providing a service to the government by functioning as the prime contractor for the system. This service is perceived by the company to be above that expected of normal industry performance as a prime contractor. The company's desire to retain and protect their historically developed perception of their public image results in a repression of the open and aggressive profit emphasis normally expected of an industrial concern.[12] This is illustrated by their hesitance in participating in profit oriented program ventures that are normal to defense programs. Incentive contracting is an example of such hesitance. Such a contracting approach is based on company profits being dependent upon performance in relation to incentives specified. The company's non-direct emphasis on profits appears to be reflected in their insistence on using approaches, such as continual cost-plus-fixed-fee contracting, that can be accomplished within the appearance of providing unselfish services to the government and at the same time also insuring a continuous conservative level of profit for the company. This contracting approach is based on company profit being aligned to a fixed fee for all program costs.

The goal category of investment in organizational viability, or resources, also reflects a basic difference between the government and industry field management organizations. The government emphasis on use of a philosophy of minimization of dedicated resources commitment, both

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[12]This is similar to the survival minimum used by Peter F. Drucker, "Business Objectives and Survival Needs," Journal of Business, XXXI (April, 1958), pp. 81-90.

personnel and organizational elements, can be contrasted with industry's emphasis on organizational expansion and maximization of dedicated organizational resources investment. The government minimization emphasis results from the previously discussed program concept of minimum commitment of dedicated organizational resources and maximum use of existing organizational resources.

Industry's emphasis on organizational resources investment is heavily aligned toward expansion. Organizational expansion and maximization support the performance cirteria of public image retention and conservative profitability. This is the result of increasing commitment of organizational resources and expansion of the organization design structure contributing to the ability of the company to better perform customer and program requirements. This supports the self-image of efficiency and public service. At the same time it supports a low-keyed emphasis on profits that results from use of such profit approaches as cost-plus-fixed-fee contracting. Expansion and maximization of organizational resources broadens the cost base upon which the fixed-fee of cost-plus-fixed-fee contracting is based and, subsequently, the probability of increased profit.

Throughout the other goal categories can be found similarities, although they are only of a partial nature. The category of mobilization of organizational resources for inputs is partially different between the two field organizations. This is due to the government resources base being basically controlled by external forces, such as program priority, Congressional appropriations and technological feasibility. Industry's resources base is controlled by customer (government)

allocations through the mechanism of a contractual arrangement. This does not preclude the probability of industry pressures being exerted relative to the government allocation of externally controlled resources. Western Electric Company, as well as the other major program subcontractors, has an active and efficient lobby in relation to the Safeguard program.

The category of observance of codes reflects a stringent type of emphasis for both the government and industry field management organizations. The bases of the stringent code observance is different for the two organizations. The government code stringency is based on standard government performance criteria, such as regulations, procedures and reports. Industry's code stringency is based on company criteria, such as Company Instructions. Due to the length of the basic anti-ballistic missile development effort, from which the Safeguard program evolved, and the situation of Western Electric Company being the primary industry participant throughout the long evolutionary system development process, differences in bases of code stringency do not result in major points of contention between the two field management organizations.

The emphasis of both government and industry rationality is technically, rather than administratively, oriented. Such a rationale emphasis results in administration of field management that primarily gives support to the technical system rather than administrative efficiency. Both the government and industry field management organizations place strong emphasis on recruitment of personnel with technical backgrounds to fill the sensitive position of the organizations. This results in filling major administrative and management positions with technically oriented personnel and, thus, much of the administrative and management emphasis

is directed toward technical aspects of the program. Integration of the non-technical with the technical aspects of the program is complicated by this technical orientation of key management personnel.

Interrelationship Implications

To identify the interrelationship implications involved in assessment of goals, it is necessary to accept certain situations that exist. The preceding discussion appears to indicate sensitive considerations pertaining to the interrelationship of organization design and program integration.

The government performance criteria are based on program accomplishment and there exists an organizational survival emphasis in government field management. There is also a commitment to minimize dedicated organizational resources. With such situational combinations, government field management is faced with the dilemma of having maximum emphasis placed on program accomplishment yet concurrently minimizing organizational resources to accomplish the management and administration of the program. Maximization of program accomplishment requires a concurrent maximization of program integration to insure that the many pieces become the composite whole of the program. To achieve maximum program integration necessitates a commitment of maximization of dedicated organizational resources, or capabilities used, so that the basic commitment of program accomplishment can be achieved. Government field management emphasis seems to be directly in opposition to this guideline.[13]

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[13] See Chapter II for detailed discussion of the government commitment to the philosophy of minimization of dedicated organizational resources in Safeguard program management.

The industry performance criteria have been identified as maintenance of the company's perception of its public image, an indirect profit orientation, an expansion type of organization design tendency and a maximized dedicated organizational resources emphasis. Program integration is of less significance to industry field management than it is to government field management due to industry's orientation toward maximum use of dedicated organizational resources. Minimization of dedicated organizational resources increases the importance of program integration whereas maximization of these resources decreased its importance. Figure 16 illustrates a consensual set of interrelationship implications resulting from goals assessment in Safeguard field management.

Summary

The operational goals of the government field management organization appear to be program accomplishment (operationalized by conversion to specific program requirements and external pressures), organizational self-preservation and satisfactory response to external pressures (administration, Congress, public, etc.). The operational goals of the industry field management organization seem to be the retention of Western Electric Company's perception of its own public image, a conservative level of profits and satisfaction of customer (government) requirements so that the first two objectives are enhanced. Both field management organizations share the objective, or goal, of program pride and prestige.

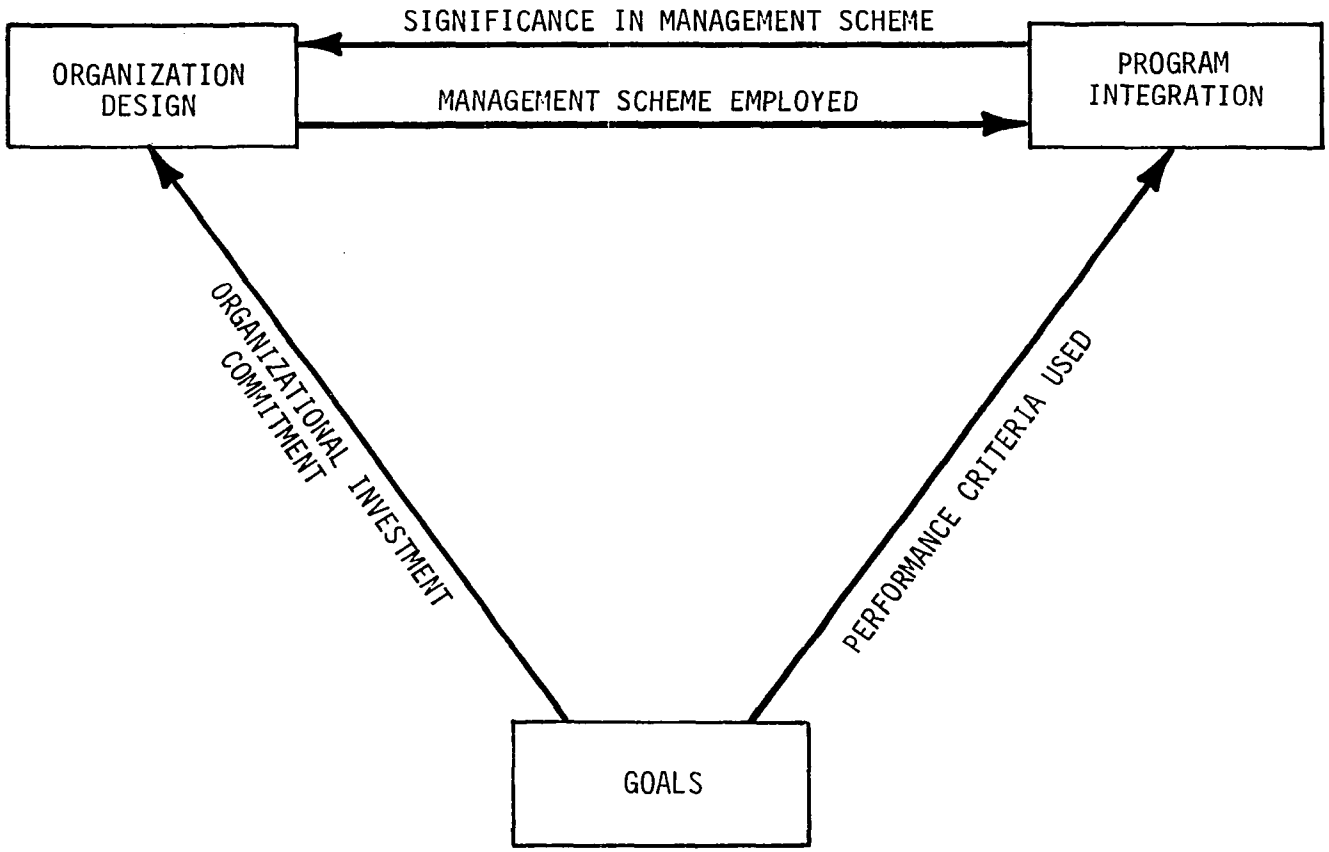


FIG. 16.--INTERRELATIONSHIP IMPLICATIONS RESULTING FROM GOALS

CHAPTER VI

PLANNING

As indicated in Chapter IV, the principal function of an organization is envisioned to be the conversion of resources into goods and services.[1] Within such a context, planning can be considered to be the input mechanism for the organizational system.

Planning is used in the sense of being the programmed process of decision making within the organizations primarily involved in the field management of the program. This view of planning is similar to the rational choice based, ends-means scheme of planning envisioned by Banfield.[2] Such a view excludes much of the standardized planning pertaining to defense programs and to the Western Electric Company. It includes only the programmed decision making process associated, directly, with the fulfillment of the identified goals of the Safeguard program field management organizations. It is, therefore, restricted to those aspects of planning that are pertinent to the interrelationship of organization design and program integration.

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[1] H. Igor Ansoff, "Planning as a Practical Management Tool," Financial Executive, XXXII (June, 1964), pp. 34-37.

[2] Edward C. Banfield, "Ends and Means in Planning," in Concepts and Issues in Administrative Behavior, ed. by Sidney Malick and Edward Van Ness (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1962), pp. 70-80.

The planning process in Safeguard field management is based on both the standard Army planning system[3] and a Safeguard program peculiar system of formal planning. The program peculiar system is the Safeguard System Master Plan.

The standard Army planning system is based on long-range, mid-range and short-range planning structures. The Basic Army Strategic Estimate is the basic guidance upon which all other Army planning activities are based. It describes national policy and the objectives to be accomplished and is a statement of the defense concept projected approximately twenty years into the future. The Army Strategic Plan is oriented toward determining the Army objectives for executing the strategic concept outlined in the Basic Army Strategic Estimate for the long-range portion of that plan. The Army Force Development Plan is a detailed analysis of the Army force structure with emphasis on the short-range portion of the Basic Army Strategic Estimate. These types of plans can be summarized as the strategic portion of the formal Army planning system.

Concurrent with and supportive of the strategic formal planning activities of the Army is the programming process. The purposes of planning are to outline requirements to implement the strategic conepts specified in long-range projections, establish the actions necessary to show the optimum application of resources, assess and evaluate the risks involved in the application of resources and identify imbalances or deficiencies involved. Programming's purpose is to translate the guidance derived from plans into programs which outline the application of resources required to implement the plans.

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[3]U. S., Department of the Army, Army Regulation 1-1, "The Army Planning System," (Washington: The Adjutant General, 1969).

The Five Year Defense Program specifies the Army's arrangements for meeting the objectives outlined in the strategic plans. A corollary to the Five Year Defense Program is the Financial Program. This program specifies the funding resources required to implement the objectives outlined in the Five Year Defense Program.

The Army Materiel Plan specifies, in detail, the equipment and services required for Army needs. This includes both those to be provided internally by the Army and externally through commercial purchase. A separate section of the Army Materiel Plan pertains to each defense weapon program and details the equipment, services, funding and organizational resources required to accomplish the program. This plan specifies such information for the current fiscal year and for five subsequent fiscal years. The Army Materiel Plan can be considered either as the lowest level of the strategic portion of Army planning or the highest level of the operational portion of Army planning.

The Safeguard System Master Plan encompasses all aspects of the Safeguard program that are conducive to coverage by a formal plan or procedure. It includes the overall organization structure for the program, assignment of tasks to non-Safeguard System Organization elements, interrelationships and interfaces involved in government management of the program, plans for routinization of special activities and other similar areas susceptible to formalized coverage.

The Safeguard System Master Plan provides a mechanism for incorporation of all major formal plans and planning activities into one "umbrella" planning structure that is, by direction, applicable to all government program participants. Many of the separate segments of the

Safeguard System Master Plan are incorporated into the government-industry production and deployment contract as legal contractual requirements.[4]

The major portion of the standard Army planning system and parts of the Safeguard System Master Plan pertain to what is subsequently referred to as stretegic, or formal, planning. It is considered to be formal planning due to emphasis being placed on those aspects of planning that can be clearly identified and projected well in advance of current operations. In contrast, operational planning pertains to those "day-to-day" plans that relate to the achievement of mandatory operating tasks, solution of existing or eminent problems and the analysis and evaluation of actual performance.

Government-Industry Similarities and Differences

In contrast to a recognizable difference in goals of the government and industry field management organizations, planning significance is basically similar for both organizations. Both emphasize the importance of planning to organizational and program effectiveness. The emphasis is heavily oriented to what has previously been identified as formal planning. Neither organization places heavy emphasis on the implementation of the myriad of formal plans that are developed nor the necessity of assuring the interrelationships and interdependencies of the many formal plans. This situation is the result of much of the formal planning requirements emanating from higher levels of government and industry. It is also reinforced by the non-relatedness of most of the formal plans to the processes involved in accomplishing the field management aspects of the program.

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[4]U. S., Department of the Army, Contract DAHC60-68-C-0017, "Safeguard Production Contract," 1969 and 1970.

Both of the field management organizations emphasize planning from the standpoint of continuation of existing planning requirements and activities, data accumulation to be used for status evaluation and presentation, and response to externally imposed planning requirements. Examples of such externally imposed planning requirements can be found in the Cost Information Report (CIR), Selected Acquisition Report (SAR), and Contract Fund Status Report (CFSR) systems that require formal planning against which progress is reported.

The planning activities pertaining to the product assurance (i.e., quality, reliability, maintainability and test) aspects of the program illustrates both the centralized, hierarchical nature of government field management formal planning and the "ad-hoc" nature of operational planning. Each functional directorate of the Safeguard System Command has a separate product assurance element as a part of its organization design. The Command itself has a product assurance staff office. A formal product assurance plan exists as well as implementing, or supporting, formal plans for specific areas.

In contrast to the many formal product assurance plans that have been developed, critical subelements of product assurance, such as test of production items, quality and reliability during the production process and reliability testing of "stock-piled" equipment, have little operational planning emphasis. The product assurance planning emphasis is oriented to formal aspects. The operational aspects are left to those necessary to respond to external pressures and current problem areas.

The industry planning process (both from the formal and operational aspects) is the result of response to the following stimuli:

1. Customer (government) imposed requirements. These requirements are those legally specified in the government contract with

industry. The customer imposed requirements are aligned to coverage of areas susceptible to industry support of government planning activities. The government's use of a philosophy of minimized commitment of dedicated organizational resources requires dependence on industry field management for planning support in certain areas. An example of such government dependence upon industry for planning support is in the area of cost estimating. The basic cost data base for the program depends upon budgetary and engineering estimates of cost that are prepared by industry and analyzed by the government.

2. Prime contractor (lead industry manager) needs. These needs are based upon operational requirements that are mandatory for performance of the prime contractor functions. They pertain to management of the subcontractor structure, integration of the overall industry program effort and coordination of the many Western Electric Company elements participating in the program. A specific example would be the planning necessary to schedule and phase equipment between subcontractor and Western Electric Company elements. The Missile Borne Guidance Equipment is manufactured by the Burlington Shops of Western Electric Company and provided to the missile subsystem manufacturers, Martin and McDonnell-Douglas, for incorporation into the missiles. As the prime contractor, Western Electric Company is responsible for planning the integration of such requirements.

3. Company imposed requirements. These requirements evolve from overall Western Electric Company procedures and policies that are applicable to all company elements. They pertain to normal business aspects and have no more than indirect applicability to the Safeguard Program.

The government planning process (both from the formal and operational aspects) is the result of response to the following stimuli:

1. Externally imposed requirements. The multiple clientele of government field management (national administration, Congress, etc.) and the response to formal Army planning requirements results in numerous externally imposed planning requirements. These requirements are aligned to the dictates of external interests and contribute little to field management needs. They are oriented to needs of outside interests and frequently conflict with field management planning needs.

2. Historically accumulated requirements. These are continuations of planning efforts that began in earlier days of the anti-ballistic missile defense effort and have continued into the present. They also have little relevancy to current operational program needs.

3. Lead government field management organization needs. These needs represent the operational planning necessities that are required to insure functioning of the composite government field management structure. They pertain to the coordination of the many government program participants, government interface with the industry field management structure and internal operations of the Safeguard System Command.

Due to the concurrency of the Safeguard program, the incremental method of program authorization that results from the annual Executive and Congressional reassessments of the program and the sequential nature of the technology involved, the formal planning process is not as critical to the program as operational planning. This is not to imply

that the formal planning process has no significance to the program; rather it is to suggest that the formal planning process is far less significant than the operational. The formal planning process does provide the reference framework within which the operational planning process operates.

During the lengthy period of time involved in development of the anti-ballistic missile system and the long wait for a deployment decision, major emphasis was placed on the development of plans and planning processes. The anticipatory nature of this period of time resulted in the development of plans and planning processes that were, by necessity, somewhat static in their perspective. They were largely based on speculation as to what would be necessary once a deployment decision was made and an operational program initiated. The decision to begin deployment of the system necessitated planning processes and plans that were responsive to "on-going" operational needs of the program. These were not directly evolutionary from the myriad of historical efforts but, rather, necessitated a major reorientation of the basic concept of planning process and plans to meet operational program needs.

From this historical environment, there remains a strong emphasis on formal planning as well as a continuing awareness of the need for more relevant operational planning. Maintenance of the emphasis on formal planning results in a commitment of significant amounts of organizational resources to support that effort. This results in competition for organization resources between formal and operational planning requirements. As a result of the government's use of a concept of minimum commitment of dedicated organizational resources, this situation is particularly relevant to government field management.

Both the government and industry field management organizations use a centralized approach to formal planning. Within the Safeguard System Command, the Comptroller and Director of Programs element is responsible for providing the focal point for overall field management planning activities.[5] Within the Western Electric Company Project Organization, the Systems Engineering and Project Control element is responsible for overall program direction and project control for the industry structure.[6] This responsibility includes the formal planning function.

The government field management organization utilizes a decentralized system for operational planning. This system is aligned to the functional concept of management that is employed in their organizational design. Industry's field management organization employs a centralized operational planning approach. This system is basically similar to that employed by industry for formal planning. The use of a system of maximized commitment of dedicated organizational resources by industry allows centralized development of plans and control of operational planning. The government's use of a philosophy of minimized commitment of organizational resources precludes such centralized control.

Industry's centralization emphasis is further supported by specified customer planning requirements and industry's centralized customer direction acceptance and response system. The customer direction acceptance and response system is based on one element of the industry

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[5]U. S., Department of the Army, Safeguard System Command, SAFSCOM Regulation 10-1, "Organization and Management Manual," November 19, 1969.

[6]Western Electric Company, Presentation at the Safeguard Executive Review Board Meeting, "Systems Analysis and Program Integration," May, 1969.

organization design structure receiving all government customer directions and one element providing all official response to such customer requests.

Figure 17 illustrates the differentation between formal and operational planning, as well as the similarities and differences in the government and industry planning methodologies.

Interrelationship Implications

The government emphasis on formal planning impacts program integration in two different respects. It, first, dilutes the operational planning capability that is available where a system of minimized dedicated organizational resources commitment is used. This results from the competition between formal and operational planning for the scarce planning resources available to the organization. Secondly, emphasis on formal planning emphasizes that aspect of planning least useful to program integration. Program integration appears to be highly dependent upon operational planning for its input process.

Government alignment to decentralized operational planning results from the organization design of its field management being functionally based in orientation. The triad of functional directorates used in the Safeguard System Command are conducive to centralization of the planning process in relation to the functional areas represented but not for centralization relative to overall field management of the program. The absence of an organization design element in the government field management structure with a basic responsibility of synthesizing, denies a focal point for emphasis on centralization of operational planning. The orientation of the Comptroller and Director of Programs element toward financial aspects precludes the use of that element as the

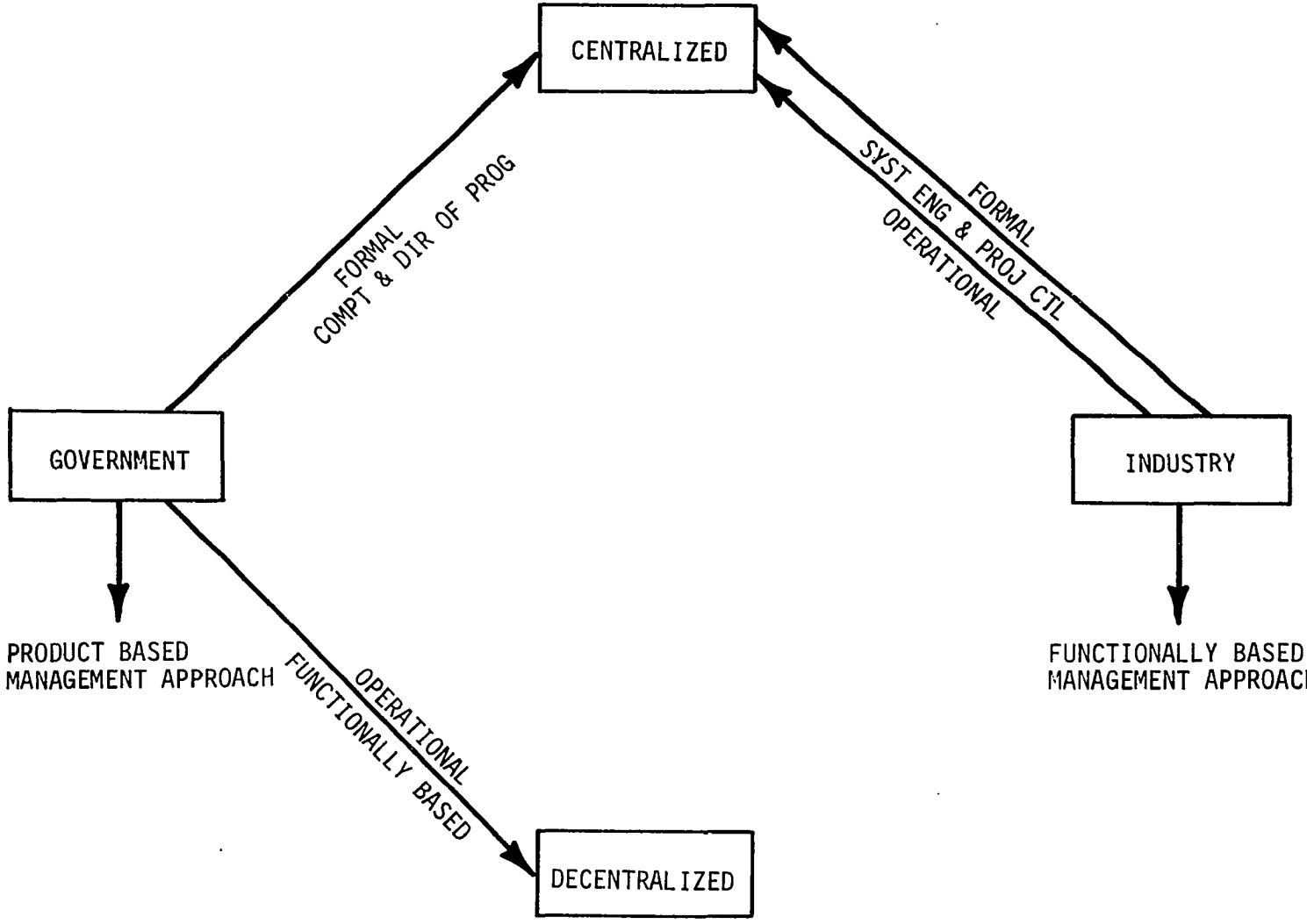


FIG. 17.--GOVERNMENT--INDUSTRY PLANNING COMPARISON

synthesizer of the functionally based operational planning segments. Although this is the case, it is the only Safeguard System Command element that has an assigned planning coordination responsibility.

Industry's joint emphasis on both formal and operational planning, as well as the centralized approach it uses for both, supports program integration needs. Program integration is also supported in the industry sector by the product based approach to organization design that is employed in its field management structure. The organization design that results from a product based approach is supportive of both the formal and operational planning processes and, subsequently, effective program integration. Within the industry field management structure, product oriented elements are pronounced. The subsystem oriented subelements of the Project Engineering and Operations organization illustrates an equipment based product alignment. Service and support type product alignments are identifiable in subelements of the Site Engineering and Operations organization.[7] Product identification and corresponding organization design alignment is not as easily recognizable in the government field management structure.

Industry's emphasis on both centralized formal and operational planning supports effective program integration through the synthesizing influence of the centralization. The support is somewhat diffused as a result of industry's centralization emphasis' inability to adequately interface with the government operational planning process. This is a result of the government decentralized mode of operation. The difficulty

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[7]Western Electric Company identification of Safeguard program product groupings is discussed in Chapter III.

of interfacing the two operational planning processes is illustrative of the basic differences in organization design structures of the two organizations.

Summary

Planning must be viewed both from formal and operational perspectives. Formal planning emphasis is necessary to support planning activities at the program policy and national defense levels but does not directly contribute to the fulfillment of field management responsibilities. Operational planning is that part of planning that directly contributes to the effective discharge of field management responsibilities. Operational planning is an integral part of the basic idea of program integration.

The formal planning process used in government field management is centralized in orientation. Its operational planning process is decentralized along functional lines that correspond, generally, to the functional areas of the program that are represented by the three functional directorates in the field management organization. The formal planning process receives stronger emphasis in government field management than does the operational planning process. Both the formal and operational planning processes of industry field management are centralized in their orientation. This is a result of the synthesizing alignment of the industry organization design structure. It is also supported by industry's use of a philosophy of maximization of dedicated organizational resources commitment to support the Safeguard program.

Decentralization of operational planning is not conducive to support of effective program integration. This is the result of the decentralization

segmenting the operational planning process and requiring an additional planning synthesization at some higher program level. Centralized orientation of the formal or operational planning processes is not supportive of program integration in itself. It is supportive if the centralization orientation is compatible in level of orientation used. Compatibility in level of orientation assists in interfacing the corollary field management organizations at a comparable level. The organization design that is employed influences the centralized or decentralized orientation and the emphasis to be given. Emphasis on formal planning, at the expense of operational planning, appears to be detrimental to effective program integration. This is due to the critical role operational planning plays in the concept of integration of a program.

CHAPTER VII

CONTROL

Control represents the conversion process of the system and is conceptually similar to the Litterer concept of control.[1] This conceptualization of control is based on the idea of control being a system in itself, concerned with the achievement of operational objectives and concerned with maintenance of the organization so that is can achieve operational objectives. Such a conceptualization of control appears to be useable in an analysis of the interrelationship of organization design and program integration in field management of the Safeguard program.

Figure 18 illustrates the composite conceptualization of control that will be used. As part of the policy formulation process, goals, or attainable operational objectives, are established for the program and the organizational elements responsible for administration of the program. In the implementation of operational objectives, performance criteria are established. Actual performance data is collected and a comparison made between the actual performance data and the established standards of performance resulting from the performance criteria. This operation, or process, is the performance measurement system.

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[1] Joseph A. Litterer, The Analysis of Organizations (New York: John Wiley and Sons, 1964), Chapter 13.

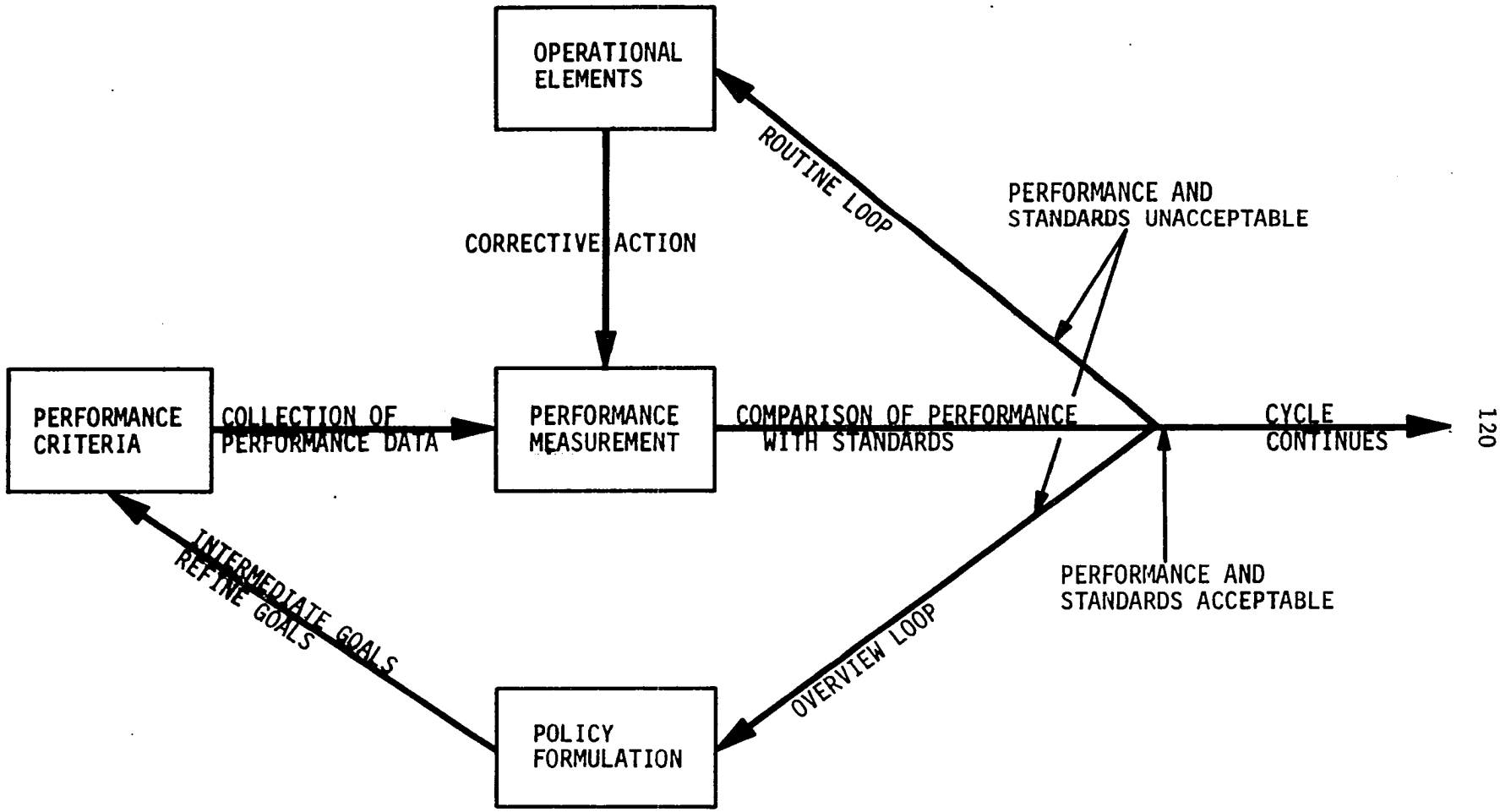


FIG. 18.--CONCEPTUALIZATION OF CONTROL

If the comparison of actual performance with established standards reflects an acceptable degree of deviation, the control system continues to move through a cyclical flow. If the comparison shows a degree of deviation that is not acceptable, either of two events occur. If the unacceptable deviation is viewed as either the result of a poor performance measurement system, an absence of emphasis on the significance of performance measurement in the overall management scheme, or if the unacceptable deviation is within the realm of correction by operational organizational elements, routine notice of such deviation is provided to the appropriate operational organizational element for corrective action. This process can be viewed as the routine loop of the control system.

If the unacceptable deviations are viewed as not meeting the conditions acceptable for reference to operational organizational elements, overview notice is provided to the policy formulation process. This policy formulation process then refines the original goals, or operational objectives. This refinement can be accomplished by either changing the goals, changing the priority placed on the different goals or changing the control system itself. Each refinement is inserted into the control system as an adjustment to the system. This process can be viewed as the overview loop of the control system.

Using such a conceptualization of control, it appears that certain key considerations are involved. The more significant of these appear to be:

1. Conversion of operational objectives to performance criteria so that the abstractness of the goals are translated into the practical context of achievable objectives is one such consideration. Such

conversion requires articulate definition and concrete understanding within and between the two field management organizations. This process illustrates the field management perspective, singularly and jointly, of the program. It also indicates the type of priority system used relative to the weight given to the different program elements and activities for which standards of performance are established.

2. Method of comparing actual performance with established standards is another key consideration. They way in which the established performance criteria is compared with the actual operational performance is illustrative of the significance of performance measurement in the basic management control scheme.

3. Method of determining whether unacceptable deviations will be channeled through the routine loop of the control system to operational organizational elements or through the overview loop of the control system to policy elements appears to be a significant consideration. This consideration is illustrative of whether a macro or micro perspective is used for control system assessments. If use of the routine loop is emphasized, micro perspective orientation is probable. Conversely, if use of the overview loop is emphasized, macro perspective orientation is probable.

4. Another consideration is the length of time allowed for the routine loop of the control system to effect corrective action to bring performance within acceptable standards before use of the overview loop of the control system is invoked. Patience with continued routine loop use is probably indicative of a philosophy of exception management and external pressure response. Impatience with routine loop actions could imply a broad monitoring orientation in the control system. Routine loop patientce could

indicate a micro orientation, whereas routine loop impatience indicates a macro orientation.

5. Once the overview loop of the control system is employed, method used to adjust the control system becomes an important consideration. The particular method used to adjust the control system suggests the adequacy of the original goals identified, the performance criteria selected to implement the actual attainment of such identified goals and the significance of the control system in the overall scheme used to administer the program.

The concept of control appears to be one of the central elements, or focal points, in the total field management scheme. This appears to be as it should in relation to this evaluation due to control representing the conversion process in the system flow.

Government-Industry Similarities and Differences

From an organization design aspect, the government control system reflects both decentralized and centralized tendencies. These are similar to the tendencies reflected by the government planning orientation. The control system is decentralized in the sense of each functional area of the organization design having basic responsibility for the control system used in its own functional area and being allowed to develop its own form of control system. It is centralized in the sense of the hierarchical nature of the government field management organization design structure specifying a distinct chain of command and a formal rank and grade structure. Centralization is also reflected by the de facto inheritance of the overall government field management control function by the Commanding General and his personal staff. This de facto inheritance is a result of the absence of a dedicated element

in the government field management organization with responsibility for performing the overall control function.

This situation is similar to that of program integration in government field management. The Comptroller and Director of Programs element is the nearest to such a synthesizing control element, although its alignment is basically to that of financial considerations. The numerous staff offices of the government field management organization design structure provide centralized control emphasis for the special areas and activities they represent. They do not provide a capability of integrating their special areas of interest and the broad functional areas of interest into a composite government field management control system.

Within the separate functional areas of government field management, centralized control is emphasized. The centralized emphasis in the functional areas results in a decentralized, or segmented, emphasis at the level of composite government field management. Without a common synthesizing mechanism, the functional directorate control efforts cannot be expected to be aligned to a common emphasis.

Without a synthesizing framework, the operational objectives of the functional areas are implemented through development of performance criteria that is aligned to the individual functional areas and not to the composite program. Actual data is collected to measure performance against the criteria established for the functional areas and not criteria relevant to the composite program.

Policy formulation, through the means of identifying and emphasizing operational objectives, basically occurs in a functional context in

government field management. Performance criteria are established on the basis of functionally oriented operational goals. Due to the government's use of a philosophy of minimized commitment of dedicated organizational resources, functionally based elements are heavily dependent upon the industry field management organization for the development of detailed performance criteria and for the collection of actual performance data. The small amount of organizational resources available to the functional elements of government requires use of industry resources for the development of performance criteria and for the measurement of actual performance. Such a situation places government field management in a dependent position in the control process, although the formal contractual arrangement places it in an independent position.

The contracting structure for the program is one of government contracts with the Western Electric Company and that company subcontracting with the other major industry participants. Such a contracting arrangement contributes to the dependent position of government field management in relation to the control process. With government field management unable to directly interface with major industry subcontractors, it has no choice but to depend upon the Western Electric Project Organization for operation of the basic industry control system, so far as operational program aspects are concerned. Operational control system is used herein in the context of the translation of goals into attainable objectives, establishing of performance criteria to implement the attainment of such objectives, measurement of actual performance against established performance criteria and the assessment of the results of such measurements.

The development of performance criteria is further complicated by many externally imposed, formal performance measurement schemes.[2] Most of these externally imposed schemes are aligned to the fulfillment of requirements eminating from Congressional and departmental levels and have little relevancy to field management needs. The government performance measurement system is, therefore, one of both responding to externally imposed requirements that may, or may not, be pertinent to operational field management needs and dependence upon the utilization of that data and criteria that industry field management develops and provides to the government. These are the bases upon which the government performance measurement system is built. With performance measurement occupying a sensitive position in relation to the concept of control used, these dependencies become important.

With a functionally based alignment in government field management organization design and a centralized emphasis on control within separate functional areas, the routine loop of the control system is most commonly used for correcting unacceptable deviations revealed in measurement of performance. The overview loop of the control system is normally only used when a "crisis" type situation occurs, or is anticipated.

The industry control system also exhibits certain tendencies toward a decentralized alignment. Goals established by the policy formulation process are fed to one organizational element, Systems Engineering and Project Control, where performance criteria are developed. This organizational element does not direct the implementation of the industry

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[2] U. S., Department of Defense, Department of Defense Instruction No. 7000.2, "Performance Measurement for Selected Acquisition," 1967.

field management performance measurement system. The implementation is accomplished by the other major elements of the organization.

Industry is faced with a segmented situation in its control system approach. The conversion of intermediate goals into performance criteria is largely based on schedule considerations. This results from the Systems Engineering and Project Control element having responsibility for the conversion of goals into performance criteria and at the same time being schedule oriented in basic outlook. The actual performance measurement system is largely based on financial considerations. This results from functional elements having responsibility for performance measurement and their basic outlook being aligned to technical and financial considerations. These diversities create an orientation conflict in relation to the industry control system.

With two major segments of the control system, performance criteria development and performance measurement, assigned to organizational elements with different basic orientations, a synthesization of the industry control system is near impossible. This segmentation tends to make industry's control system unacceptable for use in relation to overall industry field management.

Both the government and industry control systems reflect indications of decentralization. They do so for distinctively different reasons. The government decentralization indication is a result of the functional orientation used as the basis of its organization design for field management and the absence of an identifiable organization element dedicated to integration and synthesis of the control function. The industry decentralization indication is the result of a division of the

control system and process into two segments (performance criteria development and performance measurement), each the responsibility of organization design elements with different basic interests.

Within specific areas of the Safeguard program, indications of both centralized and decentralized control emphasis can be found. An example of centralized control of a specific area can be seen in relation to the control of equipment documentation (i.e., drawings, specifications, etc.). In many defense weapon programs, commercial documentation is used to accomplish production and logistic support of the system. The concept of documentation used in the Safeguard program is based on use of formal government documentation. Such documentation is aligned to the preparation and continual updating of equipment documentation to meet rigid standards of format and quality. It is released for use through a formal system of cataloging, standardization, part number assignment and supporting logistic provisioning actions. Changes to the documentation must be processed through a similar formal system before it officially becomes part of the system documentation.

In contrast, commercial documentation is based on using equipment documentation that will support industral production of the equipment, industry supplied logistical support of the equipment and the utilization of informal documentation evolving from the development effort. Commercial documentation will not meet the rigid format and quality requirements of formal government documentation. It is also not controlled by a formal change system as stringently as that used for government documentation.

The use of government documentation in lieu of commercial documentation requires formal release and change mechanisms, slower response to the

dyanmics of a program that has a high degree of concurrency between development and production, more investment in organizational resources to operate the system and generally greater cost. This results from the formalization and proceduralization associated with government documentation control. Control of commercial documentation is accomplished in an informal manner and is oriented to the rapid adjustments dictated by a dynamic program similar to that found in a concurrent program.

An example of decentralized control in a specific area can be seen through the example of system schedule control. The basic plan for deployment of the system specified certain critical dates that must be met in relation to the overall program and to the activation of specific sites. These critical dates are implemented through a system of milestones that are similar to network approaches such as the Program Evaluation and Review Technique (PERT). The milestones are developed by the responsible government implementing organizations, in conjunction with their industry corollary organizations, and submitted to the Safeguard System Office for synthesization, approval and subsequent control. This milestone system operates on an automated basis and is not strongly emphasized in operational program efforts.

A standard Program Evaluation and Review Technique (PERT) system exists in both government and industry field management. Neither organization places heavy emphasis on its use for control purposes. Government field management appears to use it to support a general milestone system that inputs the basic schedule control system and industry appears to employ it only to fulfill a requirement specified in its contract with the government.

Both the government and industry field management organizations depend heavily on the Safeguard System Work Breakdown Structure as

the reference framework for their control systems.[3] The work breakdown structure lists, in a pyramidical arrangement, all hardware (equipment), services and efforts required for accomplishing the production and deployment programs. The structural alignment of the work breakdown structure is used as a basis for performance measurement and as the mechanism for contractual arrangements between the government and industry.

The government-industry contract for production and deployment of the Safeguard system uses the work breakdown structure as the basis for specifying the equipment and services that are to be provided by industry. Due to the concurrent nature of the development and production portions of the program, equipment subsystems are the highest level of the work breakdown structure that are purchased from industry as a separate entity. The purchase of a complete subsystem at one time does not normally occur. Normal government purchase of equipment is aligned to third, fourth and lower levels of the work breakdown structure. Services are also procured using the structural generation alignment of the work breakdown structure.

Performance measurement is generally accomplished through alignment to the equipment and services specified in the contract. Desired performance in the areas of cost, schedule, quality, reliability and technical performance are specified in relation to the equipment and services specified in the contract. Industry field management reports progress against the criteria specified for the specific contractual items of equipment and services. Government field management measures

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[3]U. S., Department of the Army, Safeguard System Command, Technical Specification 715-9, "Sentinel Work Breakdown Structure," December, 1968.

performance by comparison of the cost, schedule, quality, reliability and technical performance criteria contractually specified against progress reported by industry.

Use of this type of performance measurement system results in the measurement of performance against contractual requirements and not in relation to the composite field management program, nor to a major functional segment of the program. The contract requirement method appears to be conducive to segmentation of the control process.

The concept of configuration management is also used to provide a reference framework for both the government and industry field management control systems. The objectives of the configuration management program are to establish definitive baselines for schedule, cost, hardware configuration and manpower in the production and deployment programs; to stringently control changes to these baselines to insure that all direct and indirect impacts of such changes are assessed; and to maintain a current record of the exact configuration and status of the approved system and program.[4] Detailed inclusion of this configuration management control system has been incorporated into the government administration plan[5] and into the production and deployment contracts.[6]

Configuration management normally is only applicable to the equipment aspects of defense weapon programs. The Safeguard program expansion

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[4]U. S., Department of the Army, Safeguard System Command, "Concepts of Management," (draft) 1970.

[5]U. S., Department of the Army, Sentinel System Master Plan, Part No. 3.10, Annex A, "Sentinel Defense System Configuration Management, Operating System Manual," 1969.

[6]U. S., Department of the Army, Contract DAHC60-68-C-0017, "Safeguard Production Contract," 1968, 1969 and 1970.

of the concept to include cost, schedule and manpower considerations is somewhat of an innovative approach to program management as well as a recognition of the interrelationship and interdependency of cost, schedule, manpower and equipment considerations. The broadening of this concept in the Safeguard program necessitates the establishment and control of not only an equipment baseline, but also baselines for cost, schedule and manpower. The development of definitive cost, schedule and manpower baselines is a difficult effort due to the dynamics of the program, its uniqueness in relation to experience of other defense weapon programs and the large number of government and industry program participants. Many of the program participants are aligned to different techniques of cost, schedule and manpower control, therefore, the integration of comparable baselines becomes difficult.

Interrelationship Implications

Indications of the interrelationship of organization design and program integration in field management of the Safeguard program seem to be apparent in the control process. Development of performance criteria, through conversion of goals into operational objectives and the implementation of such operational objectives, is influenced by the functionally based design structure of government field management. This alignment of the government's organization design structure results in functionally oriented performance cirteria. This forces the overall control system in the direction of a functional alignment itself and impedes overall control of the field management program.

The decision whether the routine or overview loop of the control system is to be used when unacceptable deviations occur in measurement

of performance is influenced by organization design. The particular design structure basis used appears to divert the unacceptable deviation to whatever control system loop is compatible with the organization design philosophy used. A functionally based organization design structure normally diverts the unacceptable deviation information to the routine loop corresponding to the appropriate functional area. To the functional area, the loop may be seen as overview oriented but to the overall control system it is seen as a routine loop. A product based organization design structure normally diverts unacceptable deviation information to the control loop that corresponds to the product area. To the product area the loop also represents an overview orientation but to the overall field management effort it represents a routine loop. An overview loop can be perceived only in relation to the composite field management efforts of either government or industry field management, or both.

Program integration also seems to influence the control system loop decision in relation to the emphasis placed on program integration determining the importance of performance measurement in the overall scheme. If program integration is considered to be important to the overall management scheme, performance measurement should be recognized as important. Accordingly, the routine-overview loop choice should be of major significance. On the other hand, if program integration is not considered to be important to the general scheme of management, neither performance measurement nor the routine-overview loop decision should be of major importance.

Time allowed in the routine loop of the control system before the overview loop is used, appears to be influenced by both organization design and program integration. This influence is due, primarily to the same perturbations as those used in relation to the initial routine-overview loop decision.

The method used to revise operational objectives, performance measurement and performance criteria in the overview loop of the control system seems to be influenced by program integration. If program integration is emphasized in the general scheme of management, revision of operational objectives generally appear to be oriented to:

1. Change of priority in performance criteria to increase program integration emphasis. Existing performance criteria will be revised or new performance criteria developed that are aligned to the achievement of the desired program integration emphasis.

2. Stimulation of performance measurement system to force use of the routine loop of the control system to accomplish the same results as those attainable from use of the overview loop of the control system. In essence, the overall control system becomes aligned to the composite program to the extent that the routine and overview loops become the same. The synthesis of the routine and overview loops of the control system is indicative of the synthesizing nature of the concept of program integration.

Figure 19 summarizes what appears to be the generalized organization design-program integration interrelationship implications of control that are significant in relation to field management of the Safeguard program.

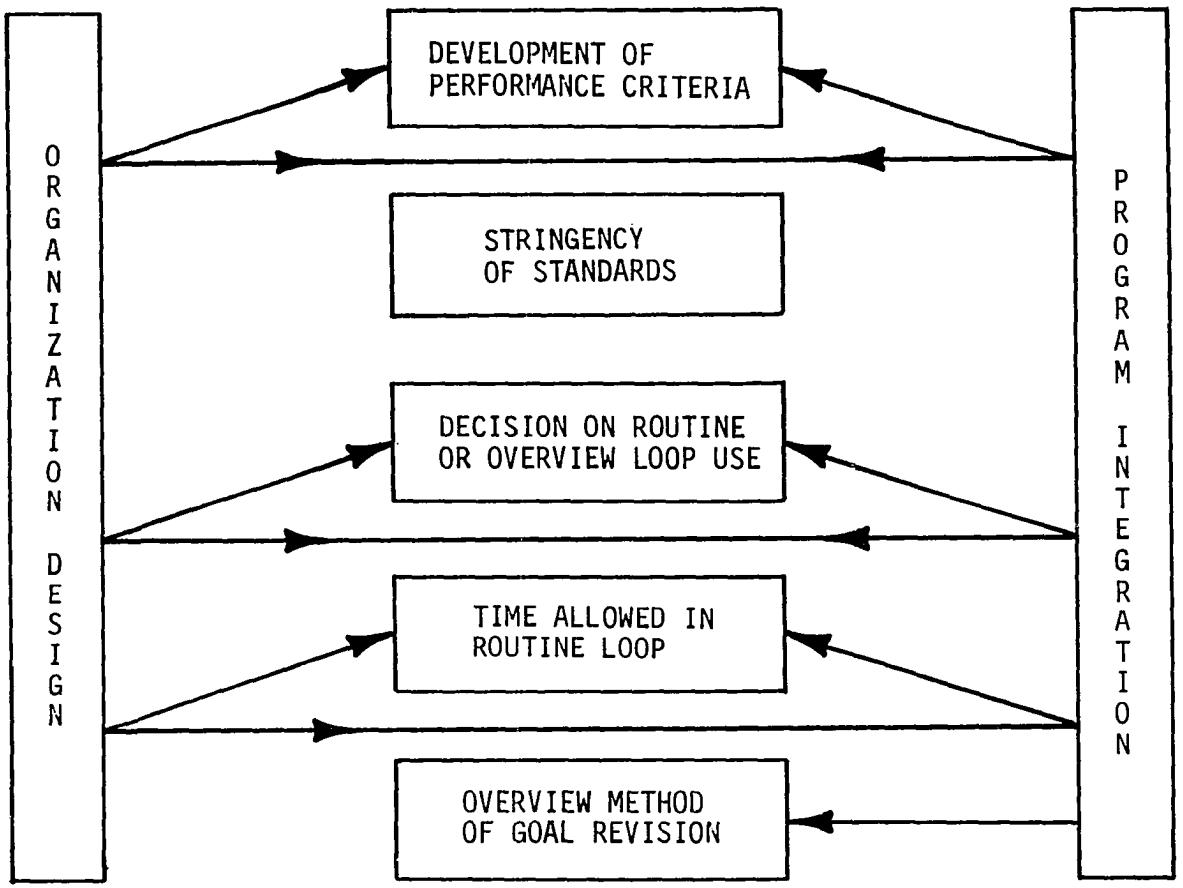


FIG. 19.--INTERRELATIONSHIP IMPLICATIONS RESULTING FROM CONTROL

Summary

Control is at the very heart of the concept of program integration. It appears to be that segment of the system around which the other system elements revolve. It functions as both the conversion process of the system and as an operative system in itself. Conversion of goals into attainable objectives, development of performance criteria to measure the objectives identified, collection of actual performance data, comparison of actual performance data with desired performance standards and corrective actions required to bring actual performance to desired performance standards seem to be the more significant elements of the concept of control and also of the operational control system.

The government control system is primarily decentralized in basic orientation. This is heavily influenced by the decentralizing nature of the functionally based government field management organization design structure and the absence of an organizational element with an overall synthesizing responsibility for control, or for program integration. Some centralized tendencies are exhibited in the government field management control system. Examples of these are the assumption of the synthesizing control function by the hierarchical apex of the government field management organization and specific control systems established for special program needs.

Industry's control system seems to be centralized in basic orientation. This could be assumed to be the result of the existence of a dedicated organization design element in the industry structure for composite control emphasis and for overall program integration. The dependent nature of industry in relation to the contractual

arrangement with the government also forces industry's control system towards a centralized alignment. There are indications of segmenting tendencies in the industry control system as a result of the development of performance criteria and the measurement of actual performance being performed by different organizational elements, each with a different basic orientation. Segmenting of these two processes has a decentralizing influence on the industry field management control system.

CHAPTER VIII

EFFICIENCY

The preceding analyses have identified the differences in output orientation of the government and industry field management organizations. With such differences, a common measurement framework for output is necessary. The concept of efficiency, in the sense of satisficing[1] and not optimizing,[2] provides a measurement framework that is conducive to encompassing both government and industry output orientations.

Simon's original criterion of efficiency demanded that alternatives be selected, from all the possible alternatives available, that would result in the largest return from the amount of resources used.[3] Such a conceptualization of efficiency is too stringent for use in assessment of system output relative to the interrelationship of organization design and program integration in field management of the Safeguard program. The use of satisficing alternatives, in lieu of optimal alternatives, provides the conceptual flexibility necessary.

The operational model (Chapter IV) based the selection of alternatives to be considered in the selection of the best (satisficing)

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[1] James G. March and Herbert A. Simon, Organizations (New York: John Wiley and Sons, 1958).

[2] Herbert A. Simon, Administrative Behavior (new York: The Macmillian Company, 1961), Chapter 9.

[3] Ibid.

alternative on those emanating from the control system. This method of filtering the possible alternatives is based on operational considerations. Simon's refinement of alternative considerations from optimum to satisficing is based on theoretical considerations.[4]

Efficiency, as an output conceptualization, provides a reference framework for the assessment of output but does not provide a basis for direct output comparison. It provides only a bases of approximate comparison. Such approximate comparisons can be seen in subsequent examples and illustrations of output efficiency orientations.

Government-Industry Similarities and Differences

The measurement of system output, or efficiency, in government field management reflects multiple clienteles and diverse pressures resulting from such multiple clienteles. It also reflects the commitment of government field management to the primary objective of program accomplishment. The commitment of the basic objective of program accomplishment reflects little consideration of efficiency in relation to balanced effectiveness.

The multiple clientele of government spans the spectrum of government and private interests. Within the government sector, interests and pressures are exerted by both the legislative and executive branches. Interests and pressures from the legislative branch can be seen by such illustrations as:

1. House Appropriations Committee interests in overall program costs and the dispersion of long-range program costs so that a satisficing

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[4]March and Simon, Organizations.

arrangement can be made between Safeguard program costs and the overall defense and government needs and available resources.

2. Senate and House Armed Services Committees interests in the relationship of Safeguard system capabilities, schedules and costs to the desired overall national defense posture.

3. Senate Foreign Relations Committee interests in the relationship of the Safeguard program to the international political arena and to the world nuclear balance. Safeguard influence in the Strategic Arms Limitation Talks (SALT) is a current example of such influences.

4. Senate and House Government Operations Committees interests in the efficiency and effectiveness of the management of the Safeguard program.

5. Joint Committee on Atomic Energy interests in the Safeguard program in relation to the nuclear capability of the system.

Interests and pressures from the Executive Branch of government can be illustrated by:

1. Department of Defense interests in the Safeguard program. These interests are based on such considerations as overall responsibility for the program resting with the Department of Defense, evaluation and adjustment of the program in relation to other defense weapon programs and Joint Chiefs of Staff interests in the overall national defense posture.

2. Department of the Army has interests that are based on it having executive responsibility for implementation of the Safeguard program. The competitive atmosphere that exists within the Department

of Defense relative to weapon programs of the different services is also apparent.

3. Office of Management and Budget, Executive Office of the President, interests in the analyses of estimated program costs, integration of program costs into the composite national system of priorities and economic capabilities, and the effectiveness and efficiency of the management of the program.

Private sector interests and pressures can be seen in such examples as:

1. Private business interests in participating in the manufacture of system equipment and in the providing of program services. Government programs relating to small business, labor surplus areas and economically depressed areas force their inclusion in program considerations.

2. Public interests relating to the location of nuclear components of the system and the methods planned for assuring nuclear safety. Pressures resulting from public nuclear safety concerns were evident in the previous Sentinel program's plan to deploy interceptor missiles with nuclear warhead capability in metropolitan areas. Such plans received strongly vocal rejection by much of the public in affected areas.

3. Local area interests in the physical location of deployed sites from the standpoint of both positive and negative economic impacts. Deployment of a site results in an influx of new residents, both military and civilian, to the local area and the use of local residents for certain aspects of site activation. Deployment of a site also entails

needs for additional educational facilities, housing and recreational opportunities, as well as other services areas.

Each of the many diverse interests and pressures express desires and objections. Such desires and objections must be analyzed, evaluated in relation to the overall program and resolved by either acceptance, rejection or compromise. Many of the diverse interests and pressures require large amounts of information for their deliberative process. The necessary information must be developed and provided with an assumption that continuing efforts and actions will be necessary by the field management organizations. The majority of the information required and the actions desired in relation to such pressures pertain to the level of program field management.

The preceding examples illustrate the diversity involved in alignment of output from the system. The system output must be arranged so that it has multiple satisfaction capabilities for the satisfaction of multiple clienteles.

With the multiple clienteles of government field management and the resultant diversity of pressures, it would be expected that efficiency values of government field management output would also be diverse in orientation and non-susceptible to comparison in an absolute sense. This appears to be the case.

From such an environment, numerous output efficiency measurement schemes have evolved. Due to the scope and diversity of such schemes, it is not feasible to consider all of the techniques and approaches used. Four examples (review and analysis, internal review, cost analysis and contractor performance evaluation) suffice to illustrate

the breadth and diversity involved in such assessments. These examples are also illustrative of the specificity exhibited by a majority of the government efficiency concerns and techniques.

The government field management review and analysis program has the objectives of improving management by:[5]

1. Using review and analysis as a source of evaluated management information in the process of decision making.

2. Incorporating review and analysis into all management and data systems in such a manner that it can be used in planning, organizing, directing, coordinating and controlling government field management operations.

3. Evaluating actual performance against the overall program and mission, with performance efficiency evaluated in both qualitative and quantitative terms, and alternatives provided to permit managers a range of choices available for decision making.

Although the government review and analysis program is intended as a comprehensive coverage of output efficiency, it appears that its orientation is heavily aligned to an information system or decision making type of application. It does not encompass the breadth of perspective necessary to satisfy the concept of program integration.

The second example of government output efficiency approaches is that of internal review. The objectives of the internal review program are to support correction of deficiencies revealed by examination and inspection actions, perform a preventative function in areas of a

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[5]U. S., Department of the Army, Safeguard System Command, "Concepts of Management," (draft), 1970.

sensitive nature, provide coordination and liaison with official external audit agencies, monitor followup actions taken to correct deficiencies noted in examination or inspection actions, aid in the assessment of internal controls used to determine efficiency and effectiveness, and insure adequacy of procedures used to develop internal controls and audit trails.[6] This program is characterized by procedural interest, retrospective observations and financial orientation. It, also, does not encompass the breadth of perspective required for the concept of program integration.

The government cost analysis program has the objectives of improving the analysis of all major program costs in order to aid in obtaining realistic requirements, the selection of the most effective system for a given expenditure, as support to contract negotiations by providing reliable assessment of resources required in a contractor's estimate and the assessment of the total resource implication involved in alternatives considered in the decision process.[7] This program is also financially oriented in its alignment and narrower in perspective than that necessary for the concept of program integration.

A final example of government output efficiency assessment approach is that of the contractor performance evaluation program. While the first three examples pertained, primarily, to the assessment of output efficiency relative to government efforts, this program is primarily concerned with government's assessment of industry's output efficiency.

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[6]U. S., Department of the Army, Army Regulation No. 37-10, "Internal Review" (Washington: The Adjutant General, 1968).

[7]U. S., Department of the Army, Army Regulation No. 11-18, "Cost Analysis Program" (Washington: The Adjutant General, 1968).

The objectives of the program are to provide a method of determining and recording the effectiveness of contractors in meeting their contractual commitments in selected programs and contracts and the determination of mutually agreeable performance criteria necessary to measure such contractor performance.[8]

The program involves the preparation of reports on contractor performance by government organizations, industry review of the government prepared reports relative to the facts involved, resolution of any inconsistencies of fact, storage of contractor performance evaluation information in a central data bank and the use of such information in source selection, contract award, profit/fee evaluation and similar government contract activities.[9] Such a program assumes that identifiable and clearly understood performance criteria exist. Use of formal contract requirements normally are the only areas that are mutually recognized and understood by both the government and industry organizations involved. The contractor performance evaluation program, like the other three examples, falls far short of the broad perspective required for program integration.

Each of the preceding examples illustrate the diversity of output efficiency measurement and assessment involved in administration of the Safeguard program, or any other program of similar complexity and scope. This could probably be a normal expectation, due to the diversity of objectives that exist in field management organizations. The diversity

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[8]U. S., Department of the Army, Army Regulation No. 715-16, "Contractor Performance Evaluation" (Washington: The Adjutant General, 1969).

[9]Ibid.

of external pressures involved and the resultant output efficiency values necessary to reflect such diversity also illustrates the need for diverse output requirements.

Industry's approach to output efficiency is distinctively different than that of government. Industry's approach must be viewed from two different aspects; that of efficiency relative to satisfaction of customer(government) requirements and that of efficiency relative to satisfaction of company interests. The first is largely based on the formal contract between the government and industry field management organizations. It pertains to that segment of industry effort that the contractor performance evaluation program attempts to measure and assess. In addition to the contractor performance evaluation program requirements, most of the Safeguard program contracts require comprehensive progress reporting by industry for use in government evaluation.[10] These reports represent another means of government assessment of the industry output efficiency and assists industry in evaluation of its own output efficiency.

The second aspect of output efficiency in industry field management pertains to one of the most sensitive areas of information access in any business operations. It involves investigation of what a business concern believes its own interests to be. These are interests above those of fulfillment of customer requirements and entails information of a highly privileged nature. Without free access to such privileged information, interpretations must be made from the information available. It appears that Western Electric Company's satisfaction of company interests in

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[10]U. S., Department of the Army, Contract DAHC60-68-C-0017, "Safeguard Production Contract," 1968, 1969 and 1970.

relation to field management of the Safeguard program involves retention of the company's perception of its public image, Safeguard program pride and prestige and conservative profitability. These are the same objectives previously identified for industry in relation to field management of the Safeguard program.[11]

The differing output efficiency orientations and values within and between the government and industry field management organizations are indicative of the necessity of having a reference framework for consideration of composite output efficiency. Program integration provides such a reference framework if the organization design structure enables it to be used as the relativity system for output efficiency measurement and comparison. If the organization design structure is not conducive to emphasis of program integration, the development and use of a relative comparison framework for output efficiency becomes difficult. The macro perspective of program integration and its synthesizing interest pertain to such a relative comparison framework for output efficiency.

In the government sector, output efficiency is measured more in relation to response to the external pressures of the multiple clientele than it is in relation to total program progress. This results from government field management's use of a management by exception and response to external pressures approach. This situation is further reinforced by the use of a philosophy of minimized commitment of dedicated organizational resources.

The exception and response to external pressures orientation of government output efficiency measurement results in varied and differing

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[11]Chapter V provides a detailed analysis of these goals.

efficiency ingredients. These range from cost and schedule to quality and reliability; each requiring a different unit of measurement and each likely to be incompatible with the other output ingredients in an absolute comparative sense. The Joint Committee on Atomic Engegy emphasis on nuclear safety, the Office of Management and Budget emphasis on automated information systems and small business emphasis on manufacturing a specific piece of system equipment are illustrative of the diversity of output ingredients involved.

Industry's system of output efficiency is measurable in relation to customer requirements and company requirements. As the supplier, in a customer-supplier relationship, industry must judge its own output, and its output is judged by others, relative to satisfaction of customer imposed demands. This is different than the government situation wherein a myriad of varied output emphasis are required to meet the interests andpressures of the diverse clienteles involved.

Western Electric Company's output efficiency orientation is not directly related to profit standards, as would be expected of an industrial concern. Its efficiency emphasis is a mixture of retention of its historically developed perception of the company's public image, personal program pride resulting from its many years of association with defense surface-to-air weapon programs and a degree of profit orientation that is in consonance with support of the other company output orientations.[12] As would be expected, this mixture of output emphasis results in a varied set of output efficiency values.

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[12]Chapters II and V discuss the basic foundation upon which the Western Electric Company orientation is based.

Interrelationship Implications

With the government output efficiency criteria based on response to external pressures of multiple clientele and with a functionally aligned organization design structure, program integration must function as the relative reference framework for the determination and assessment of output efficiency values. The use of a functional approach for field management organization design results in functionally aligned program integration and not program integration from the total program overview perspective. A functionally based organization design structure, such as that employed by the Safeguard System Command, appears to preclude use of a synthesizing perspective, unless an organization design element is specifically identified as having responsibilities for such a synthesizing function. Such a situation results in the output efficiency values resulting from the external pressures generated by the multiple clientele being relative only to the functional areas reflected in the organization design structure or to the external pressure areas. The output efficiency values are not relative to the composite field management program.

Industry's mixture of output efficiency values, measurable in terms of company interests and customer requirements satisfaction, presents an even more difficult dilemma than does that of the government situation. The differences in government relative output efficiency pertaining to the response to pressures of multiple clientele and having a functionally based organization design structure are so varied that development and maintenance of an overall output efficiency relativity framework is recognized as a near impossibility. With industry field management

output efficiency generally measurable relative to satisfaction of customer requirements and company interests, the assumption is usually made that such output efficiency values are measurable in relation to each other and to some composite. Such is not the case when the output efficiency values are based on such diverse interests as satisfaction of customer requirements, retention of the company's perception of its public image, pride in the Safeguard program and conservative profit emphasis. Each of these output efficiency emphasis depends on a different value base and are not readily related to each other in any absolute sense. They are measurable only in relation to the composite perspective of a total program integration framework.

Summary

If defense weapon programs must exist in an atmosphere of response to the pressures of multiple clientele, as it appears they must, measurement of the values of their output efficiency must be structured so that the variations in values can be related to each other and to a composite program whole. Program integration, as the overview perspective, provides such a relative measurement framework. Program integration's ability to function as the relative measurement framework for output efficiency values appears to be dependent upon the structure of the organization design. If the organization design is synthesizing in orientation, program integration can reasonable be expected to function as the relative framework. If it is segmenting in orientation, program integration cannot function as such a relative framework.

Government output efficiency is aligned to the satisfaction of diverse interests of multiple clientele. The organization design

structure is segmenting in orientation. This is due to the functional basis used. There is no identifiable synthesizing element in its organization design structure. Program integration is not aligned to the macro perspective of total program field management and, therefore, cannot be expected to function as the relative framework for output efficiency. It appears that government field management does not have a relative framework for output efficiency.

Industry output efficiency is aligned to the satisfaction of customer imposed requirements and company interests. Its organization design structure is generally synthesizing in orientation. This assumption is based on the existence of an organization design element that is identified as being responsible for synthesization of industry field management efforts. Although not emphasized by industry field management, program integration is capable of functioning as the macro perspective for it's program field management. It is, therefore, capable of functioning as the relative framework for output efficiency. In essence, industry field management does not use a relative framework for output efficiency but is capable of so doing.

CHAPTER IX

COMMUNICATIONS

Communications is used in the broad sense of distribution, receipt and exchange of information, data, opinions and concerns. With such a broad definition, communications appears to reflect the flow of life and viability within a system, as the concept of system is used in this study. Barnard felt that communications occupied a central position in a comprehensive theory of organization because the structure and scope of the organization depends upon communications.[1] Simon supported the importance of communications because without it there was no influence on decisions of individuals in the administrative process.[2]

Government-Industry Similarities and Differences

In both the government and industry field management efforts, communications, as a concept, is used almost synonymously with management information. In defense weapon programs, management information is normally considered in the sense of automated information and formally reported planning status. The government policies relative

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[1]Chester I. Barnard, The Functions of the Executive (Cambridge: Harvard University Press, 1938).

[2]Herbert A. Simon, Administrative Behavior (New York: The Macmillan Company, 1961).

to management information systems perceive management information to be primarily an automated data processing type of information.[3] Within the government sphere of Safeguard program field management, the basic management information structure is the Safeguard Management Information System.[4] This management information system is based on a computerized process, using "on-line, real-time" techniques.

The Safeguard Management Information System employs automated information bases for such areas as system configuration, technical documentation, costs, schedules, manpower and contracts. The information bases are continually updated and theoretically represent "real-time" information. Management makes use of the information through remote access, "on-line," terminals located in all major government field management elements.

Although the management information system is based on centralized data, immediate access and mutual usage, it contains only that information susceptible to automated processing. Quantitative formal requirements and reports make up the majority of the information base. It is not a system for communications, if use is made of the broad interpretation of communications previously specified. The system is not conducive to the exchange of opinions, ideas and inferences.

Communications is considered in this analysis in a broader sense than that used for standard government and industry information

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[3]U. S., Department of the Army, Army Regulation No. 18-1, "Management Information System," (Washington: The Adjutant General, 1970).

[4]U. S., Department of the Army, Office of the Chief of Staff of the Army, "Safeguard Management Information System," 1968.

and automated information systems. Management information and automated information systems should be considered only as part of the information and data exchange portion of the broad concept of communications that is used.

Communications in government field management must be viewed from two distinctively different perspectives. These are formal communications and informal communications. The hierarchical nature of government organizations, especially apparent in military and para-military organizations, appears to require a controlled flow of formal communications as part of the hierarchical relationship structure and as part of the organizational survival process.

A hierarchial organization design structure appears to require a corollary formal communications system. The formal communications system normally corresponds to the hierarchical structure of the organization design. If the roles of the organization design structure requires a "step-by-step" progression up and down the hierarchy, the corollary formal communications system has a tendency to follow the same "step-by-step" progression.

The roles resulting from the formal military rank and civilian grade structure in government requires such a "step-by-step" progression up and down the hierarchy. The formal communications system also appears to follow the same pattern. Such a formalized hierarchical alignment of the formal communications system orients the information passed through to that supportive of the hierarchical structure of the organization design. Each level of the hierarchy tends to filter the information flowing upward and downward in the formal communications system. The

control necessary to achieve the desired filtering restricts the kind of information and its speed of flow in the system. Government field management is faced with the restrictions of the formal communications system that result from such a hierarchical filtering of information that tends to occur when "step-by-step" progression is used.

As previously noted,[5] the organization design used in government field management exhibits a tendency toward organizational survival as one of its objectives. This organizational survival emphasis competes with the basic government field management goal of program accomplishment. The organizational survival emphasis requires a controlled flow of information through the formal communications system so that the survival requirements of the organization can be given appropriate priority in relation to other competitive requirements.

The objective of program accomplishment require the free flow of voluminous amounts of information. The scope and freedom of flow of the information required for program accomplishment is not conducive to the controls exerted by the formal communications system. As a result of this situation, the informal communications system provides the mechanism for the flow of the majority of the information required for achieving the program accomplishment objective.

Formal communications is accomplished through an upward and downward flow in the hierarchical pyramid. Due to the dependency relationship of lower members of the hierarchical pyramid in relation to those higher in the pyramid and the formal rank and grade (position) structure

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[5]See Chapter V for detailed analysis of government field management goals.

used in government field management, formal communications are generally restricted to those that are required by regulations, those considered by the lower levels of the hierarchy to be of personal benefit to pass upward, those considered by the upper hierarchical echelons to be essential for the lower levels to function and those resulting from crisis situations.

The emphasis on formality and proceduralization in the physical communications process further reinforces the restrictive control of the formal communications system. This is the area of government operations that earns the stigma of "bureaucratic red-tape." Formal communications in government field management requires elaborate coordination efforts, higher official approval and formalized processing. The amount of effort and time necessary to insert information into the formal communications system precludes its use in more than semi-static situations.

The insertion of information by the Safeguard System Command into the formal communications system between that command and the Safeguard System Manager illustrates the formalization and proceduralization involved. Once the originating organization element has determined that the substance of the information is correct, coordination is required with all other organization design elements having a pertinent interest. The number of organization elements with which coordination is necessary depends upon the subject of the information. As a minimum, the three functional directorates, the Comptroller and Director of Programs and the Contracts Office must review the information. The number of elements with which coordination is necessary may be greater if the information is relevant to the Command staff office. Once

the coordination is completed, the information must be authenticated by the signature of either the Commanding General or a designated member of his personal staff.

The absence of a government field management organizational element responsible for integration requires that such formal coordination and authentication be accomplished before information is inserted into the formal communications system. The existence of an organizational element dedicated to program integration should alleviate much of this type of effort and delay in handling information. It should also support increased use of the formal communications system.

As a result of the controlled and restrictive nature of the government formal communications system, an information system has evolved that transmits both informal and formal communications. This normally occurs as a parallel to any formal communications system. The informal communications system serves a distinctively critical function for government field management because of the controlled and proceduralized nature of its formal communications system. The informal communications system is an integral part of the government design structure for field management.

The existence of an informal communications system, as well as the sensitive part it plays in overall government field management, is easily recognizable. An illustration of its existence and sensitive position can be seen in relation to personal staffs of key members of the government field management organization. Many of these key positions encompass a scope and complexity of responsibilities for which

personal staffs would be beneficial. The organization structure excludes legitimized personal staffs at less than the level of the Commanding General. To circumvent the absence of legitimate personal staffs, informal ones are created. By use of the informal communications system, critical information is passed to selected members of the organizational elements. Access to this critical information, in conjunction with the ability to return information to the incumbents of key positions, allows the key positions to develop informal, semi-legitimate personal staffs. The semi-legitimate nature of the informal communications system that results from such situations further dilutes the effectiveness of the formal communications system.

Communications can be viewed more from a composite perspective in industry field management than it can in government, although not to the point of being able to say that there is only one communications system in the Western Electric Project Organization. There are both formal and informal communications systems in that organization, but the two are more congruent than are those in government field management.

The congruence of the formal and informal communications systems in industry field management is a result of multiple factors. One contributing factor pertains to the difference in orientation of the two organization design structures. The government organization design structure is segmenting in alignment and has no element dedicated to the integration of the composite program. This necessitates more formality in the relationship of the separate organization design elements

to each other. Industry's organization design structure is more synthesizing in alignment and has an element dedicated to integration of the composite program. This situation results in less formality in the relationship of the organization design elements to each other.

Another contributing factor to the congruence of the formal and informal communications systems of industry field management pertains to the informality of industry's role structure when compared to the government role structure. Industry field management does not have as formal a rank and grade structure as that of government. Industry does not hesitate to move personnel freely from one position in the organization design structure to another. The formal rank and grade structure of government field management does not allow the same degree of flexibility. The informality of the position role relationship in industry field management allows freer use of the formal communications system and less dependency on the informal communications system.

The formal communications system in the Western Electric Project Organization is stringently controlled and centralized in relation to communications with the Safeguard System Command. Much of the information exchanged between the Safeguard System Command and the Western Electric Project Organization occurs in a formal environment. Informal information exchange between the two organizations is not heavily emphasized.

From the perspective of industry itself, the stringently controlled and formalized communications process used in relation to information exchange with the government field management organization is both beneficial and desirable. The customer-supplier relationship invoked

by government contracting procedures and requirements demands a centralized supplier orientation to the government, as customer. The use of formalized information exchange supports industry field management centralization and control of response to customer requirements. From the perspective of overall program benefit and mutual support, such a formalized and centralized arrangement between the two organizations limits the mutually synthesizing capability of the two organizations.

Interrelationship Implications

With government field management having a stringently controlled and proceduralized formal communications system and a resultant necessity of using an informal communications system for much of the information required for operational needs, program integration becomes exceedingly difficult to achieve. The controlled and proceduralized nature of the formal communications system in government field management does not provide the amount, kind, or timeliness of information necessary for effective program integration. Therefore, program integration must depend heavily on information available only through the informal communications system. With the informal communications system recognized as a necessity, but not legitimized, program integration has to concern itself with the sensitivity of the informal communications system information it uses. This sensitivity must be assessed in relation to both the formal hierarchical organization design structure and the formal rank and grade structure.

The achievement of the macro perspective of program integration requires access to a comprehensive scope of information that exceeds that possible from the controlled and proceduralized formal communications

system of government field management. The informal communications system provides much of the additional information needed for program integration but conflicts with the formality and hierarchical arrangement of the government organization design structure and the formal rank and grade system. The conflict between the informal communications system and the hierarchical arrangement of government field management makes program integration's use of information from the informal communications system dependent upon achievement of an acceptable balance between its tendency to intensify the basic conflict and that of obtaining minimal program integration needs.

Emphasis on program integration is further complicated by the functionally oriented nature of the government organization design for field management. The stringently controlled and proceduralized formal communications system is segmented along functionally oriented lines (research and development, production and logistic support, and site activation) and the informal communications systems that arise are also functionally aligned. Each informal communications system is generally aligned in support of a particular functionally based formal communications system that corresponds to the functional elements of the organization design structure. The informal communications systems, therefore, are segmenting in orientation and do not provide the comprehensive scope of information required for effective program integration. They do not provide the synthesizing influence normally expected from an informal communications system.

The stringently controlled and centralized nature of the industry-government formal communications system used for field management restricts

the flow of information required for the government program integration process. Illustrative of these controls is the situation of government customer direction to industry and industry's response to customer requests. Only a small number of individuals within the government field management organization (Safeguard System Command) can provide official customer direction to industry field management. Industry requires that all government requests for information be directed to one particular element of its organization design structure. The information from the one specified element of industry's structure is considered as the only official Western Electric Project Organization position in its relations with government field management. Such formalized and proceduralized restrictions appear to greatly impede the flow of information necessary for effective program integration. These restrictions also tend to reinforce the use of the informal communications systems. This pertains to both the internal and interface relationships of the two field management organizations.

Summary

Both formal and informal communications systems exist in government and industry field management. Use of the formal communications system appears to be most pronounced within the government field management organization and between the two organizations. The stringency of the formal communications system in these two situations necessitates use of informal communications systems.

Program integration apparently is dependent upon both the formal and informal communications systems for the information it requires. The controlled and proceduralized nature of the formal communications

system is not conducive to providing the amount, type and timeliness of information necessary. Program integration has to be concerned with the sensitivity of the information it uses from the informal communications system. This sensitivity must be assessed in relation to the hierarchical organization design structure and the formal rank and position systems used, especially in government field management.

The functional alignment of the government organization structure further segments both the formal and informal communications systems. It also increases the difficulty of achieving effective program integration. The functionally based government organization structure supports the evolution of multiple informal communications systems that are generally aligned to individual functional areas. The resultant functional alignment of the informal communications systems partially dilutes their effectiveness by channelling their orientation to specific functional areas and not to the comprehensive orientation informal communications systems normally have. The absence of a comprehensive informal communications system in government field management intensifies the significance of the segmenting effect of the functionally based organizational structure.

Industry's formal and informal communications systems are more congruent than are those of government field management. The informal communications system in industry field management is more comprehensive in scope than the functionally based informal communications system of government. Such comprehensiveness of scope provides an integrative effect on industry's organization structure and on its overall communications process.

CHAPTER X

SUMMATION OF INTERRELATIONSHIPS

Indications of the interrelationship of organization design and program integration in field management of the Safeguard program have been of paramount concern in the preceding analysis. It is now necessary to summarize the interrelationship indications that can be identified as a result of the separate analyses and to synthesize such interrelationship indications into a Safeguard field management composite. It is also necessary that such interrelationships be projected to the level of possible applicability to similar situations. The accomplishment of these objectives in the purpose of this chapter.

The sensitive aspects of the interrelationship of organization design and program integration will be summarized for each of the system element analyses. A synthesizing framework will be developed and used as the structure for integrating the composite Safeguard program indications and for their projection to broader applicability.

Sensitive Aspects of System Elements

The following indications of organization design and program integration interrelationships were suggested as a result of the assessment of the concept of goals:

1. If an organization design structure is supporting a program that is required to respond to multiple goals, the macro perspective

of program integration appears necessary to synthesize such multiple goals.[1] Both the government and industry field management organizations have to respond to multiple goals, therefore, a program integration perspective appears to be mandatory for both organizations.

2. If the management philosophy employed for an organization design structure emphasizes minimized commitment of dedicated organizational resources, the importance of program integration appears to be intensified.[2] If the management philosophy emphasizes maximum commitment of dedicated organizational resources, program integration's importance appears to be decreased.[3] Government field management emphasizes minimized commitment of dedicated organizational resources, therefore, program integration's importance can be assumed to be increased. Industry field management emphasizes maximized commitment of dedicated organizational resources, therefore, program integration's importance can be assumed to be decreased.

3. The compatbility of organization design structures between corollary organizations is dependent upon the mutuality of the goals of such organizations.[4] The basic goals of government field management have been identified as program accomplishment, organizational survival and satisfactory response to pressures of multiple external clientele. The basic goals of industry field management have been identified as retention of the company's perception of its public image,

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[1] See Chapter V, pages 84-87.

[2] See Chapter V, pages 96-97.

[3] See Chapter V, pages 96-97.

[4] See Chapter V, pages 96-97.

Safeguard program pride and prestige, and a conservative level of profits. The goals of the two organizations are, therefore, mutually incompatible.

4. The structure of an organization design appears to suggest the importance of program integration in the overall management philosophy.[5] If the organization design is synthesizing in structure, program integration's importance is implied. Conversely, if it is segmenting in orientation, it is implied that program integration is of little importance. The organization design structure of government field management is segmenting in orientation, thus program integration can be assumed to be of little importance. Industry field management's organization design structure is synthesizing in orientation, therefore, program integration's importance is implied.

The following indications of organization design and program integration interrelationships were suggested as a result of the analyses of planning:

1. Both formal and operational planning systems exist in Safeguard program field management. Which of the two is emphasized appears to depend upon the importance of program integration in the basic management philosophy employed.[6] Emphasis on formal planning suggests a low degree of importance for program integration, whereas emphasis on operational planning suggests a high degree of importance for program integration. Government field management emphasizes formal planning, whereas industry field management emphasizes operational planning.

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[5]See Chapter V, page 108.

[6]See Chapter VI, page 111.

2. Operational planning appears to be a basic element in the macro perspective of program integration.[7]

3. The organization design structure appears to influence whether formal or operational planning will be emphasized. If the organization design structure is segmenting in orientation, it appears that formal planning is normally emphasized. The government organization design structure is segmenting in orientation, therefore, it can be assumed that formal planning is emphasized. The industry organization design structure is synthesizing in orientation, therefore, it can be assumed that operational planning is emphasized.

4. The alignment of the formal and operational planning process toward a centralized or decentralized mode appears to be contingent upon both the organization design structure and the importance of program integration to the general management philosophy.[8] A synthesizing organization design alignment appears to be conducive in use of decentralized modes for both formal and operational planning. Conversely, a segmenting organization design alignment appears to be conducive to use of centralized modes of planning. The emphasis placed on program integration also seems to influence the mode of planning used from the same synthesizing-segmenting considerations. Government field management has a segmenting orientation of its organization design structure and also does not emphasize the importance of program integration. Industry field management has a synthesizing orientation in its organization design structure. It does not emphasize program integration, although, it is capable of so doing.

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[7]See Chapter VI, page 110.

[8]See Chapter VI, pages 110-111.

The following organization design and program integration interrelationships were suggested as a result of the assessment of the concept of control:

1. The structure of the organization design seems to influence the choice of performance criteria used to implement organization goals.[9] A functionally aligned organization design structure normally results in performance criteria aligned to support of the functional areas and not to the total field management effort. The functionally aligned organization design structure of government field management results in the development of performance criteria aligned to support of the separate functional areas represented in the organization design structure. Industry's organization design structure is not functionally aligned and the performance criteria it develops reflects a basic interest in satisfaction of customer interests.

2. The alignment of the control system to a centralized or decentralized mode appears to be dependent upon the structure of the organization design.[10] A centralized control system should result if the organization design is synthesizing in orientation. The synthesizing element of the organization design structure appears to provide the integrative mechanism for the organization and, therefore, force centralized control to be practiced. An organization design structure that is segmenting in orientation seems to force emphasis on decentralized control. The absence of an organization design element dedicated to the integrative function appears to prohibit an emphasis on centralized

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[9] See Chapter VII, page 126.

[10] See Chapter VII, pages 117-121.

control. The government organization design structure is segmenting in orientation and also emphasizes a decentralized mode for its control system. Industry's organization design structure is synthesizing in orientation and its control system emphasis is aligned to a centralized mode.

3. The control system appears to be a basic element in the macro perspective of program integration.[11] Control provides both the operative and regulative mechanisms for program integration.

4. The customer-supplier relationship invoked by government contracting procedures forces centralized control in the relationship between the two organization design structures involved.[12] The customer must articulately specify the legal requirements of the supplier and the supplier must specifically respond to such legal requirements. Such formality and legality forces centralized control within the two organizations in their relations with each other.

The following organization design and program integration interrelationships were suggested as a result of the analyses of the concept of efficiency:

1. Measurement and comparison of output efficiency is performed in an atmosphere of multiple, diverse interest satisfactions.[13] Government field management exhibits a large number of diverse interests that must be satisfied by the output of the organization. Industry

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[11] See Chapter VII, pages 126-128 & 130.

[12] See Chapter VII, page 119.

[13] See Chapter VIII, pages 139-141.

field management exhibits a lesser number of interests but such interests are more diverse than are those of government.

2. Output efficiency that is aligned to the satisfaction of multiple interests appears to require a relative framework within which measurement and comparison can be performed.[14] Program integration provides such a relative framework if the organization design structure is aligned so that the importance of program integration is emphasized. The government field management organization design structure does not emphasize the importance of program integration, thus a relative framework of output efficiency does not exist. Industry's organization design structure is aligned such that program integration's importance can be emphasized. Although industry does not directly emphasize the importance of program integration, it is capable of so doing.

3. The structure of the organization design seems to influence the priority of the output efficiencies involved.[15] An organization design structure oriented to synthesis should result in emphasis on output efficiencies that are supportive of the composite program. The converse should result if the synthesis orientation is not emphasized. The government organization design structure is segmenting in orientation. Output efficiencies are emphasized that support the separate areas represented by the functionally based organization design structure, the satisfaction of interests of the multiple clientele involved and the support of the organizational survival interest. Industry's organization

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[14] See Chapter VIII, page 141.

[15] See Chapter VIII, pages 143-144.

design structure is generally synthesizing in alignment, thus output efficiency is oriented so that the composite program is supported.

The following organization design and program integration interrelationships were suggested as a result of the assessment of the concept of communications:

1. The extent of use of informal communications systems appears to be dependent upon the structure of the organization design.[16] If the organization design structure is either hierarchically based or segmenting in its alignment, use of informal communications systems seems to be necessary for the exchange of information required for program integration. If the organization design structure is not hierarchically based or segmenting in alignment, less use of the informal communications system appears to be necessary and there should be more congruence between the two. The government organization design structure is hierarchically based and segmenting in orientation, thus use of informal communications systems appears to be necessary. Industry's organization design structure is less hierarchically based than that of government and is also synthesizing in orientation. This indicates less requirement for use of the informal communications systems and more congruence between the informal and formal communications systems.

2. The macro perspective of program integration is dependent upon access to varied and voluminous amounts of information.[17] If the formal communications system is controlled and procedurealized, the informal communications system must function as a source for a large

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[16] See Chapter IX, pages 149 & 154.

[17] See Chapter IX, pages 154-155.

amount of the needed information. The government formal communications system is stringently controlled and proceduralized, thus the informal communications system must be used for much of program integration's information needs. Industry's formal communications system is less controlled and procedurealized than that of government, thus there is less dependence on the information from that system.

3. Use of the informal communications system for program integration information needs results in conflicts between that system and the formal organization design structure.[18] The hierarchical arrangement of the formal organization design structure appears to depend on control of the flow of information. Use of the informal communications system circumvents such control. This conflicting situation is especially recognizable in government field management.

4. The structure of the organization design appears to influence the orientation of both the formal and informal communications systems.[19] If the organization design structure is synthesizing in alignment, both formal and informal communications systems should exhibit synthesizing tendencies in their structure. Conversely, if the organization design structure is segmenting in alignment, both communications systems should exhibit segmenting tendencies. The government organization design structure is segmenting in orientation and as a result both its formal and informal communications systems exhibit functional alignments that are segmenting in emphasis. Industry's organization design

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[18] See Chapter IX, page 155.

[19] See Chapter IX, page 157.

structure is synthesizing in orientation and the results are both its formal and informal communications systems exhibiting an integrative alignment.

The organization design and program integration interrelationship indications identified in the preceding section are by no means the only indications of such interrelationships. They represent only those indications that appear particularly relevant to a composite organization design and program integration interrelationship and those more prevalent in field management of the Safeguard program

Theoretical Hypothesis

Before attempting to synthesize the interrelationship indications of organization design and program integration, it appears necessary to develop a theoretical construct of what such interrelationships possibly should be. Figure 20 reflects such a theoretical construct. The basic elements of the construct are management philosophy, organization investment emphasis, structure of organization design, importance of program integration and methodology of program integration. The basic purpose of the construct is to determine a general flow, or casual chain, of events in a logical condition of organization design and program integration interrelationship.

Due to the large number of sensitive aspects suggested as a result of the separate analyses, some synthesizing mechanism is required. Such a mechanism must be capable of incorporating the large number of diverse indications of interrelationship that are involved. To accomplish this necessitates movement to a higher level of generality than that of the

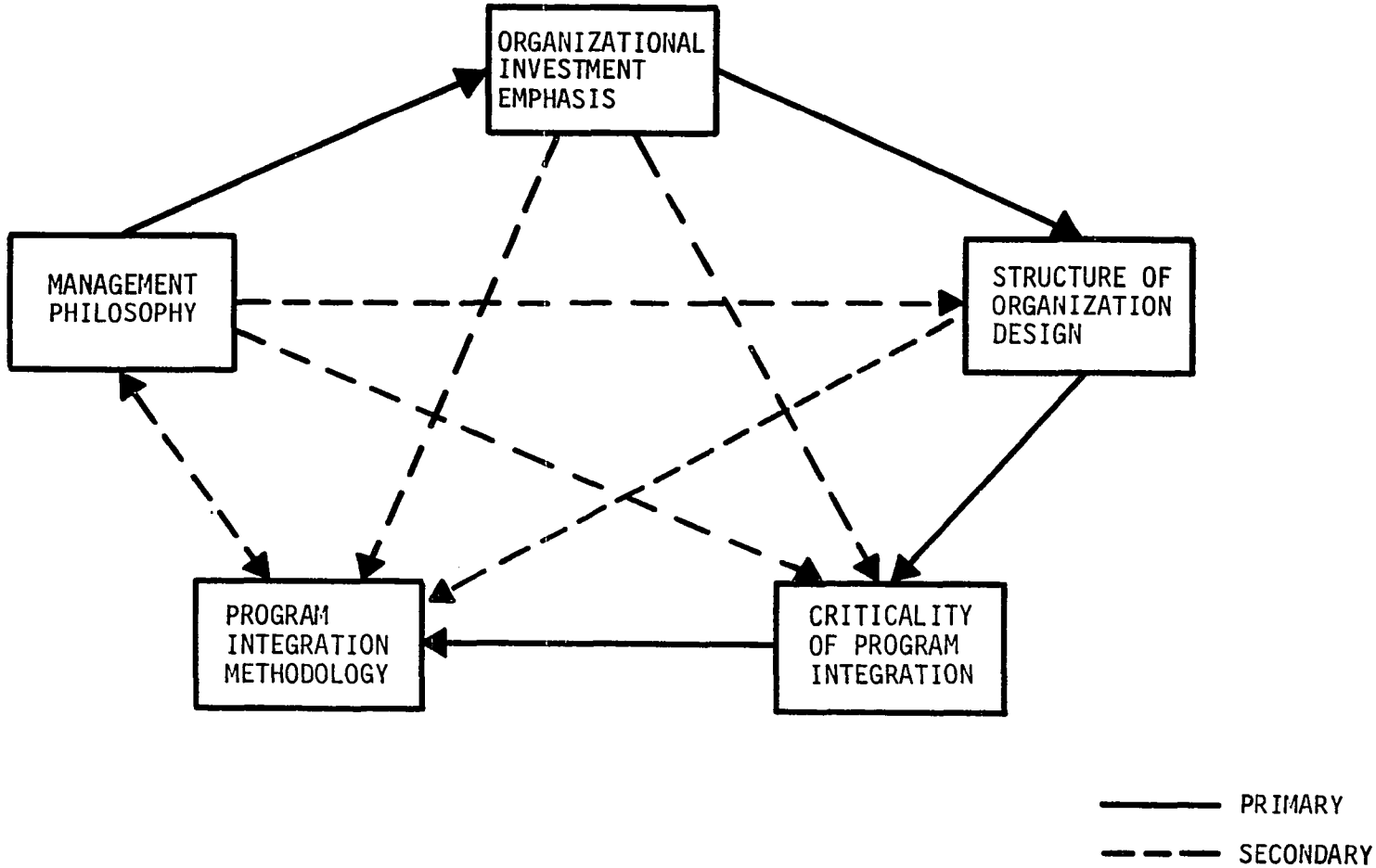


FIG. 20.--INTERRELATIONSHIP HYPOTHESIS-THEORETICAL

individual system element analyses. The purpose of the theoretical hypothesis is to provide such a mechanism.

The basic elements used in the theoretical hypothesis were selected on the basis of their generality, apparent relevancy to the many interrelationship indications and their conduciveness to translation into subsequent hypotheses used. Each basic element of the theoretical hypothesis represents a summation of numerous interrelationship indications. Each element is generally understood as an area of consideration in both government and industry field management.

Management philosophy represents the initiation of the casual flow process due to its ability to portray a mechanism for achieving goals. Management philosophy generally determines the organizational investment emphasis that is employed. It also determines the structure of the organization design used, although the structure is constrained by the organizational investment emphasis. It would be nearly impossible to use an organization design structure that required maximization of organization resources investment when the management philosophy dictated a minimization of organizational resources investment.

The structure of the organization design determines the importance of program integration to the general scheme of management. This does not mean that program integration importance is not influenced by organizational resources emphasis or the management philosophy used. It must stay within the confines of the organizational resources available and must be compatible with the general management philosophy employed. It does mean that the importance of program integration appears to be primarily determined by the structure of the organization design. If the

organization design structure is basically macro oriented, program integration should be of less importance than if the structure were micro oriented.

Importance of program integration determines the particular program integration methodology that will be used. This is not indicative of program integration importance being the only determinant of program integration methodology; only that it is the primary determinant. Secondary influence is exerted on program integration methodology by the organizational resources investment emphasis that determines the resources available to accomplish a particular program integration methodology selected.

The theoretical construct cannot be perceived as open-ended. The results from the program integration methodology employed will become part of the continual reassessment of the management philosophy. Other secondary influences also exist in the theoretical flow.

Transitional Hypothesis

A theoretical construct can be considered logically sound but it cannot be directly applied to the composite interrelationship of organization design and program integration in field management of the Safeguard program. To consider such a composite interrelationship necessitates use of a transitional step. The transitional step must function to operationalize the theoretical hypothesis by relating it to the interrelationship indications resulting from the previous conceptual analyses. Figure 21 reflects such a transitional hypothesis.

The identification of goals represents the initiation of the causal flow in the transitional sequence. Identification of goals reflects the

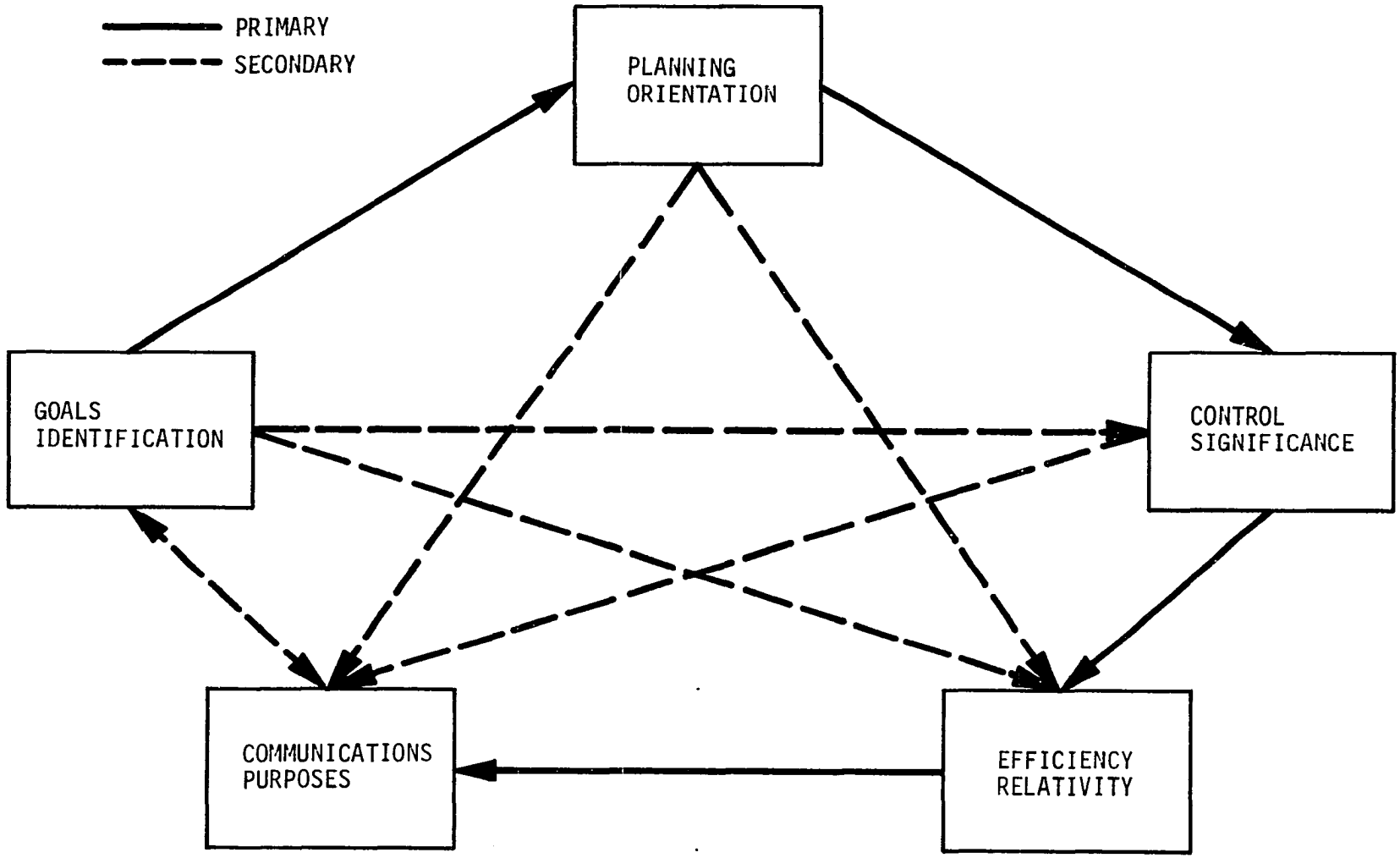


FIG. 21 .--INTERRELATIONSHIP HYPOTHESIS-TRANSITIONAL

foundation upon which the field management effort is built. The performance criteria used to implement the identified goals influences the planning orientation by determing whether the formal or the operational planning system, or both, will be emphasized as the reference framework for the implementation of goals.

Orientation of the planning process (formal, operational, or both) influences the significance of control. If the formal planning process is emphasized, there is pressure to use the routine loop of the control system. Conversely, if the operational planning process is emphasized, there is pressure to use the overview loop of the control system.

The importance of control in the general scheme of management influences efficiency relativity. The performance criteria used to implement the attainment of goals and as the basis for control forces use of varied and diverse efficiency outputs. The varied and diverse efficiency outputs require a reference framework for use in measuring and comparing the relative efficiency of the outputs. Emphasis on use of the overview loop of the control system requires an adequate reference framework for output efficiency.

Relativity framework for output efficiency influences the purposes of communications. If the output efficiency is aligned to performance criteria implementing goals of a diverse nature, the formal communications system will be emphasized. If a loose relative framework for output efficiency is employed, the formal communications system will be used to insure that some degree of consensus is reflected. If a stringent reference framework for output efficiency is employed, the informal communications system will be used.

Composite Hypothesis

After consideration of both a theoretical and a transitional hypothesis, a final step appears to be necessary. This step is the development of a composite hypothesis that can be used to consider the applied aspects of the interrelationships identified. Figure 22 portrays such a composite hypothesis, combining the theoretical and transitional hypotheses previously used. The dotted lines reflect the composite groupings of hypotheses stages, assuming the theoretical and transitional hypotheses congruent, as they appear to generally be.

Using such a composite hypothesis, certain indications of organization design and program integration interrelationships appear projectable to the level of general applicability. These indications are:

1. Both the organization design structure and the degree of program integration emphasis must be aligned to the satisfaction of multiple goals. The structure of an organization design, in itself, apparently does not determine its ability to satisfy multiple goals. The organization design structure's ability to emphasize program integration is what influences its ability to satisfy multiple goals. Program integration provides the reference framework within which multiple goals can be balanced and satisfied in relation to themselves and to a composite.

2. The management philosophy that is employed must be theoretically capable of being implemented by the organization design structure. If the management philosophy is based on minimization of dedicated organizational resources, it must also emphasize the importance of program integration. Minimal use of dedicated organizational

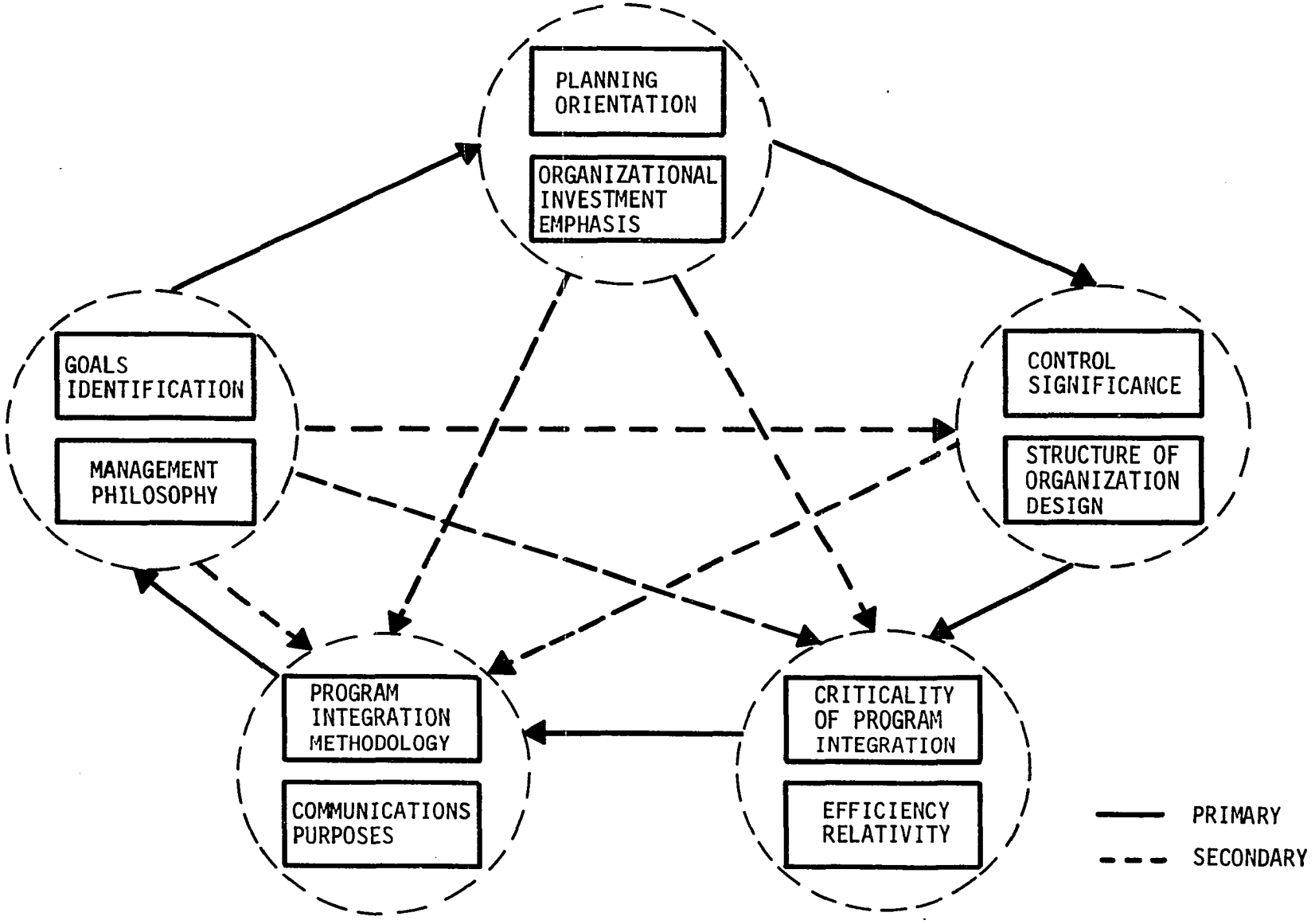


FIG. 22.--INTERRELATIONSHIP HYPOTHESIS-COMPOSITE

resources requires concurrent emphasis on program integration to compensate for the absence of such dedicated organizational resources. If the organization design structure is segmenting in orientation, program integration emphasis is not possible. A management philosophy based on minimal use of dedicated organizational resources would reflect a logical inconsistence and would be almost impossible to implement.

3. If the macro perspective of program integration is important to the management philosophy employed, operational planning should be emphasized. Operational planning provides the adjustment mechanism for program integration. The organization design structure must also be supportive of operational planning emphasis.

4. Use of the overview loop of the control system must be emphasized if the organization design structure is segmenting in orientation. The overview loop of the control system provides a synthesizing effect and becomes near synonymous with the concept of program integration. This assists in negating the segmenting orientation of the organization design structure.

5. Program integration provides a reference framework for output efficiency assessment. If the organization design structure is segmenting in orientation, program integration cannot be emphasized sufficiently to provide such a reference framework.

6. The informal communications system must be used to provide information necessary for program integration if the organization design structure stringently controls or proceduralizes the formal communications system. Use of the informal communications system for such required

information alienates the formal organization design structure by circumventing its controls.

7. The program integration methodology that is used is dependent upon the structure of the organization design. If the organization design is segmenting in orientation, directed and forced methods of program integration are necessary. If it is synthesizing in orientation, implied and voluntary methods of program integration can be used.

8. Interdependent organizations must give relative emphasis to the importance of program integration. Strong emphasis by one and weak emphasis by the other dilutes the effectivensss of the emphasis of either, or both. The similarities of the organization design structures of the interdependent organizations contributes to the probability of relative emphasis each gives to program integration.

CHAPTER XI

CONCLUSION

The objectives of this study were to determine if organization design and program integration were interrelated in field management of the Safeguard program; if so, to identify such interrelationships; and to project the interrelationships to a level of applicability to similar organizations and programs. To address such multiple objectives, the conclusion is directed, first, to the identification of the general organization design and program integration interrelationships that are conducive to general applicability to similar organizations and programs. The conclusion, secondly, addresses the interrelationships of organization design and program integration that are directly applicable to field management of the Safeguard program.

Consideration of interrelationship indications of direct applicability subsequent to consideration of those that appear projectable to similar organizations and programs, may appear to put the "cart before the horse." The rationale for the sequence is based on the weight given to the theoretical basis of the system model used. A theoretical analysis, based on the system model and the conceptual representations used, was conducted concurrent with the applied analysis illustrated by field management of the Safeguard program. Consideration of the interrelationship

indications that are conducive to general applicability places the results of the theoretical analysis "one-step" ahead of the indications deduced from field management of the Safeguard program. It also allows the interrelationship indications pertaining to the applied aspects of Safeguard program field management to be subjected to some form of test.

As a prologue, the conclusion will consider corrective actions necessary to balance organization design and program integration in field management of the Safeguard program. Implementation necessary to effect balanced emphasis will be suggested and based on the minimum changes necessary to balance interrelationships of general applicability with those directly applicable to field management of the Safeguard program.

It is evident from the preceding discussion that one objective of the study is assumed to have been accomplished. This is the objective of determining if organization design and program integration are interrelated. The assumption is made that they are strongly interrelated. The preceding analyses appear to support such an assumption.

Implications of General Applicability

The preceding analyses suggests that the structure of an organization design is strongly influenced by the organizational resources investment philosophy used. If this philosophy is one of maximization, organization design possibilities are almost unlimited. If the investment philosophy is one of minimization, the possibilities are limited and the organization design structure must

be such that the philosophy of minimized organizational resources investment is optimized.

The importance of program integration in the general scheme of management appears to be strongly influenced by the perspective of the organization design structure. Program integration becomes an automatic ingredient if it is macro oriented. Program integration is either non-existent or non-operational if the general scheme of management is micro oriented.

Program integration seems to be one of the critical elements in implementing the management philosophy selected. Program integration plays less than a critical role if the organization resources investment philosophy allows the latitude of resources necessary to implement that organization design of maximum benefit. Conversely, if the investment philosophy restricts the organization design possibilities available, program integration plays a critical role in making whatever organization design is selected work effectively.

Some element of the organization design structure must be identified as that element responsible for the development and retention of the macro perspective of program integration is to perform its critical role in the overall management philosophy. The element of the organization design structure responsible for the macro perspective must be one that does not have to dually respond to the macro perspective concern and a concurrent responsibility for an area of micro interest. Organization design structure elements with responsibilities for both macro and micro perspective areas appear to have a tendency to lean toward emphasis of the micro areas. This probably is due to the difficulty of performing the macro perspective function in relation to the micro functions.

Operational performance measurement appears to be the control system for both organization design structures and program integration systems. Performance measurement is the conversion of the program and organization goals to operational performance criteria, the subjection of that criteria to measurement and evaluation in a relative framework and the effecting of corrective actions required to keep the control system in balance through time. Performance measurement is, thus, the mechanism for the relative comparisons upon which program integration depends.

The basic elements of the concept of program integration appear to be:

1. Goals identified through the process of developing performance criteria that can be used in a control system. Goals perceived in this manner are automatically operational in nature.

2. Emphasis on operational planning to provide the mechanism for continually adjusting the control system in dynamic environments.

3. Control system based on operational performance measurement. Operational performance measurement relates the control system to the applied context.

4. Relative framework for determining and comparing output efficiencies that are aligned to varied and diverse goals. The relative framework provides a major segment of the macro perspective of program integration.

5. Necessary information flow provided through either a formal communications system that is not stringently controlled or proceduralized or through an informal communications system that is recognized as being semi-legitimate.

The particular organization design structure used or the degree of emphasis given to program integration are suggested as not being of as much importance individually as their relative emphasis in relation to each other. If a theoretically ideal organization design structure is used and program integration importance is not given emphasis, the theoretical benefits of the ideal organization design structure cannot be realized. If a theoretically maximum emphasis is given to program integration in an imbalanced organization design structure, the results of such a maximum emphasis will be less than that theoretically possible.

Interdependent organization design structures appear to require that the management perspectives of such organizations be mutually compatible. If one organization design structure emphasizes one aspect of a management philosophy and the corollary organization does not also do so to a comparable degree, the results of the emphasis of the one organization will be neutralized by the action or inaction of the second organization.

In summary, the following propositions of general applicability are proposed in relation to the interrelationship of organization design and program integration:

1. The organizational resources investment philosophy that is employed influences the organization design structure possibilities available for use.

2. The particular perspective (macro or micro) that results from the organization design structure that is employed effects the importance of program integration in the overall management philosophy.

3. To emphasize the importance of program integration requires a dedicated organization design structure element for development and retention of the necessary macro perspective.

4. Performance measurement functions as the control system for both the organization design structure and program integration.

5. The basic elements of program integration are goals specified through operational performance criteria, operational planning, performance measurement functioning as a control system, relative framework for output efficiency and a loosely controlled formal or semi-legitimate informal communications system.

6. Interdependent organization design structures require mutual compatibility of perspectives.

Applied Safeguard Peculiarities

If the suggested propositions of general applicability are assessed in relation to their direct application to the Safeguard program, it is possible to provide further support of their pertinence by examining the applied context from which they evolved. This would also assist in transcending the semantics gap between the abstractness of general applicability propositions and the concreteness of Safeguard program peculiarities.

The influence of organizational resources investment philosophy limited the organization design structure possibilities available to government field management. It enables industry to select and apply an organization design structure from almost unlimited possibilities.

The government's use of a philosophy of minimized dedicated organizational resources restricted the organization design possibilities

available to those capable of being performed with such an organizational resources investment limitation. The government's selection of a functionally aligned organization design structure appears to be in consonance with the limitations imposed by such an organization resources investment philosophy. The functional alignment to three basic groupings (research and development, production and logistics, and site activation) is indicative of an attempt to focus the limited organizational resources on areas of major importance. The absence of an organization design element responsible for the macro perspective decreases the ability of the functional alignment to operate effectively using a philosophy of minimized dedicated organization resources. The use of a large number of staff offices further dilutes the amount of organizational resources available when such a philosophy is used.

Industry's use of a philosophy of maximized dedicated organizational resources and a product based organization design structure appear to be compatible. The government's use of a philosophy of minimized organizational resources investment is balanced somewhat by industry's use of a significantly different philosophy. The limitation on use of dedicated organizational resources in government field management is somewhat off-set by industry's use of maximized dedicated organizational resources.

The macro perspective of program integration is critical in government field management. The multiple goals of the organization that result from pressures of external clientele, the use of a philosophy of minimized dedicated organizational resources, and the use of a segmenting type of functionally based organization design structure, when combined, demands the macro perspective of program integration

as a reference framework. The absence of an organization design element responsible for the macro perspective intensities the importance of program integration. The absence of such an element is partially compensated by the situation whereby the hierarchical apex of the government organization design structure has assumed the operational macro perspective function.

The macro perspective of program integration is not as important in industry field management as it is in government field management. Industry's organization design structure is more synthesizing in orientation than that of government's. Although the product and service alignment of industry's organization design structure is micro in perspective, the macro perspective is maintained through use of an organization design element dedicated to such a perspective. The effectiveness of the industry macro perspective organization design element is somewhat diluted by its inability to interface with a comparable government field management element at less than the level of the Commanding General.

Both the government and industry organization designs diverge from the general applicability proposition that when program integration is important a dedicated organization design element is necessary to develop and retain the macro perspective. The divergence from this proposition appears to be the result of diametrically opposed situations. In government field management, program integration is important but no dedicated organization design element exists. In industry field management, program integration is less important than in government but a dedicated organization design element exists. The existence of a

dedicated organization design element for the macro perspective in industry's structure apparently is not detrimental to the interrelationship balance of organization design and program integration. Its absence in the organization design structure of government field management seems to be detrimental. The detrimental effect in government field management is partially alleviated by the existence of the dedicated element in industry's organization design structure and by the hierarchical apex of the government organization design structure assuming an operational role in relation to the macro perspective.

The general applicability proposition relating to performance measurement functioning as the operational control system is recognized by both the government and industry field management organizations. Although recognized, the proposition is implemented only in a sterile sense in both organizations. Government field management is faced with having to respond to numerous situations of externally imposed performance measurement schemes. The benefits of these performance measurement schemes must be assessed in relation to higher levels of government than that of Safeguard program field management. To program field management they provide little, if any, benefit. The combination of having to respond to many externally imposed performance measurement schemes and the use of a philosophy of minimization of dedicated organizational resources dilutes the government field management capability. This situation denies the use of performance measurement as the operational control system and, thus, denies program integration one of its basic elements.

In its role of operational control system, performance measurement is reflected as a mixed condition in industry field management.

Performance measurement, in the sense of industry's role of supplier, does not function as the operational control system. It is mechanistic and sterile in nature. Industry's efforts in relation to internal company needs does function as the operational control system. Use of this system and its results are not accessable to the relationship between industry and government field management nor to the composite field management effort.

Recognition of the basic elements of program integration appear to exist in both government and industry field management. Although recognized, optimizing of the elements is not necessarily emphasized. With program integration important in government field management, optimizing of its basic elements is necessary. With program integration being of less importance to industry than it is to government, optimizing of its basic elements is not as mandatory as it is in government field management.

The need for retaining comparable levels of emphasis is not emphasized by either government or industry field management. Industry's ability to emphasize program integration, when program integration is less than critical to its scheme of management, is one such illustration. Government's inability to emphasize program integration, when program integration is critical to its scheme of management, also illustrates the absence of emphasis on the need for comparable levels of emphasis.

The general applicability proposition that interdependent organization design structures require mutual compatibility of perspectives is not emphasized in field management of the Safeguard program. Program integration is critical to the government, but not as much so to industry. Industry's organization design structure has the ability to emphasize

program integration, the government's does not. The government's organization design structure has no dedicated element for the macro perspective, industry's does. Industry's organization design structure is based on product, that of the government on function. Each of these conflicting situations illustrates the incompatibility of perspectives between the government and industry field management organizations.

Safeguard Implementation

To suggest implementing actions necessary to balance organization design and program integration in field management of the Safeguard program, it is necessary to establish certain "groundrules" that must be followed in the development of such implementing actions. These "groundrules" are:

1. Situations illustrated by the preceding discussion of Safeguard program peculiarities provide the bases for suggesting implementing actions necessary to achieve balance between organization design and program integration.

2. The propositions of general applicability provide the framework within which the implementation suggestions are formulated.

3. Maximum use is made of implementation suggestions that encompass correction of more than one indication of imbalance.

Using the above "groundrules," the following implementation actions are suggested as those minimally necessary to achieve organization design and program integration balance in government field management:

1. Establish a government organization design element dedicated to the development and retention of the macro perspective. This would provide the synthesizing influence necessary to emphasize

program integration. It would alleviate the imbalance between an organization design structure both segmenting in orientation and requiring program integration emphasis and the present inability of the organization design structure to emphasize program integration. Such an element should enhance the ability of the presently existing macro perspective element in the industry organization design structure by providing that element a comparable interface point. The perspectives of the interdependent field management organizations should become more compatible.

2. Use program integration as the reference framework for output efficiency measurement and comparison. This would allow the pressures of the multiple clientele of government field management to be assessed in relation to the basic goal of program accomplishment and not as separate entities in themselves.

3. Relax the emphasis on formality and proceduralization in all aspects of the program. This would require relaxation of the formal rank and grade structure, less emphasis on the formal planning process, and less control and proceduralization in the formal communications system. This should result in increased emphasis on the operational planning process as a basic element of program integration, less use of the informal communications system and its resultant conflict with the formal organization design structure, and a more comprehensive program perspective for members of the organization.

4. Reorient performance measurement efforts toward satisfaction of operational control system needs. Performance measurement aligned to satisfaction of such needs would enable field management

program status to be evaluated in relation to the operational program environment and not in relation to sterotyped criteria now used. Externally imposed performance measurement schemes would have to be satisfied as by-products of operational needs.

The following implementation actions are suggested as those minimally necessary to achieve balance between organization design and program integration in industry field management:

1. Relax the stringent control on communications between the industry and government field management organizations. This would allow information presently available in industry field management to be made available to the composite effort. Due to the formalization involved in contractual arrangements, the contract documents do not suffice as the sole mechanism for government use in obtaining information from industry.

2. Elevate program accomplishment to major importance as an industry goal. This would require deemphasis of the present industry goal of retention of its perception of its public image. Increasing the importance of program accomplishment as an industry basic goal should support the basic goal of government field management and make the goals priority of the two organizations more compatible. Less emphasis on the goal of retention of the company's perception of its public image would require company recognition that the Safeguard program is a defense weapon programs and by chosing to serve as the prime contractor the company assumes the public image of a defense contractor.

3. Recognize the customer-supplier relation in field management of the Safeguard program. Industry, as supplier, must provide whatever services and efforts that are desired by government, as customer.

Recognition of the supplier dependency should support program integration needs by reducing the formality emphasis now used by industry.

4. Use the same performance measurement system for inter-relationship with government field management as that used for intra-company needs. The present performance measurement system used in relation to government is based on formal contract requirements. Such performance measurement is sterile in relation to the composite program. Measurement of performance from the standpoint of relations with government field management and of intra-company needs should be the same. Dual systems in industry field management decreases the ability of performance measurement to function as the operational control system for the composite program.

Although the suggested implementations can be viewed as "oughts," their relevance to the subject of organization design and proggram integration interrelationship in field management of the Safeguard program are apparent. They represent the ultimate step in the analysis of an applied subject. Analysis of a practical subject should identify the sensitive aspects involved, establish the theoretical framework that is applicable, determine the results of the particular study, project the results of the particular study to the level of general applicability, and derive a corrective benefit for the particular subject of the study. The suggested implementation actions provide a corrective benefit for field management of the Safeguard program.

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