Navy planning and management : a closer relationship.

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NAVY PLANNING AND MANAGEMENT: A CLOSER RELATIONSHIP

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A CLOSER RELATIONSHIP

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INTRODUCTION

Since 1958, there have been three significant developments which are interdependent and which greatly affect the administration of the Navy. It is the purpose of this thesis to discuss these developments and to relate their bearing upon future concepts and conduct in the Navy management program.

The most recent development is the Reorganization Act of 1958, which placed the responsibilities for the operational command of the Armed Forces in the Office of the Joint Chiefs of Staff.[1] This change puts the operational control of the assigned naval units under the command of unified commands or specified combatant commands. The Chief of Naval Operations, therefore, is tending more and more to take on the appearance of an executive vice president who is responsible for integrating the organization, administration, and management of the Navy Department to meet the requirements of the commands established by the Joint Chiefs of Staff. This relationship makes it imperative that his decisions and actions support the operational commanders to the best of his ability.

Undoubtedly, there is and will continue to be some opposition to the concentration of the operational

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[1] U. S., Congress, Department of Defense Reorganization Act of 1958, Public Law 85-599, 85th Cong., 1st Sess., 1958, p. 5.

responsibility in the Office of the Joint Chiefs of Staff rather than with the three departments. Although Admiral Burke is known to be vigorously opposed to this policy, he is forced to comply because of the actions of the Secretary of Defense. In a few months when the Admiral retires, the President will undoubtedly select a successor who fully supports this concept. Secondly, the policies of the Department of Defense are not conceived in isolation, but rather they are principal parts of our total strategy and total national policy. These policies no longer can be broken down neatly into three dimensions--land, sea, and air, because there are now at least two more dimensions--space and time which are boundless. In addition, these strategies and policies include factors that are political, economic, and psychological, as well as military. A purely military peacetime decision is seldom made.[2]

The second development which is gaining acceptance in the Department of Defense is that the job of economizing, which some people would delegate to budgeters or comptrollers, cannot be distinguished from the whole task of making military decisions. Mr. Charles J. Hitch, currently the Assistant Secretary of Defense (Comptroller), and Mr. Roland W. McKean expressed this thought in this way:

> Strategy and cost are as interdependent as the front and rear sights of a rifle. One cannot assign relative weights to the importance of the positions

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[2] Cf., Thomas S. Gates, Jr., "No Lag in United States Defenses," Vital Speeches of the Day (June 1, 1960), pp. 487-88.

> of the front and rear sights. It does not make sense to ask the correct position of the rear sight except in relation to the front sight and the target. Similarly one cannot economize except in choosing strategies (or tactics or methods) to achieve objectives.[3]

This development has grown more significant every year since the Korean War because of the increasing cost of weapon systems. The technological advances in the weapons of war and the weapons of peace have caused the national security expenditures to grow from $13.0 billion in 1950 to $45.6 billion for fiscal year 1960.[4] This growth no longer suggests a cost-consciousness of thousands of dollars here or there, but rather an awareness of long-range planning which forecasts the costs associated with programs from inception to phasing out. This cradle-to-grave concept must be implemented because of general awareness that our nation must not be confronted with a growing, ever-steepening spiral of military expenditures.

The third development is the tremendous strides being made in the understanding of management and application of new and radically different aids. In the area of decision-making, for example, there are many groups working and progressing such as the economists, psychologists, neurophysiologists, information theorists, cyberneticians, operations researchers,

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[3] Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age (Cambridge, Mass.: Harvard University Press, 1960), p. 3.

[4] U. S., Department of the Navy, Office of the Comptroller, The Budget Process in Navy, NAVEXOS P-2254 (June, 1960), pp. 1-6.

and others.[5] These scientists are all thinking in the field of decision-making theory. But the connotation indicated here is the use of the term management in its broader sense of tactical planning, policy implementation, execution of strategic plans, and goal-seeking procedures. Since this paper has purposely chosen the naval aspects of management, this parameter also adds a special connotation. It is hastily stated, however, that the ideas, examples, and implications of business management from whatever source derived will be used to relate, to illustrate, to equate the meanings and practices to military management.

Since management does not exist by itself, it will be necessary to consider the supplementary terms of organization and administration. Organization is the formal structure of authority, lines of communication, and formal relationship of offices. Administration is the strategic planning, goal-setting kind of behavior at the policy level. Management uses the organization to carry out its objectives. Organization is the structure of an effective machine.

Oliver Sheldon correlates these terms as follows:

> . . . management is . . . the control of the process of executing a given policy and is to be clearly distinguished, as regards both the activities involved and the abilities required, from the formulation of policy, which is the task of the process known as administration. The two together constitute the control of the enterprise. In order that they may function a living structure is built by the process of organization,

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[5]Merrill M. Flood, "Management Science Today and Tomorrow: Decision Making," Management Science, I (January, 1955), pp. 167-68.

> so that what is to be done and the persons to do it are grouped for the most efficient working. These three processes--administration, management and organization--are common to all corporate undertakings.[6]

With this definition of management the barest suggestion of the activity in the field was offered in the area of decision-making. Other achievements are evident in problem-solving, management simulation, mathematics as it relates to management decisions, automatic data processing, and, in general, the new tools and techniques associated with management.

These three developments then, are interdependent. As the functions of operations per se become in fact the responsibility of the Joint Chiefs of Staff and the Unified Commanders, the job of the service chiefs become more nearly the functions of military managers.[7] The service which can provide the maximum defense per dollar of cost will assume a more dominant role. The means to achieve this objective can be reached only through the most efficient management of the resources made available to it.

In 1956, David Novick and G. H. Fisher in a series of articles entitled, "The Role of Management Tools in Making Military Decisions," advanced as their fundamental theory that there is a necessity for using management tools only after

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[6]Oliver Sheldon, "Management," Encyclopedia of The Social Sciences, ed. Edwin R. A. Seligman, X (New York: The MacMillan Company, 1937), p. 77.

[7]Infra., p. 14.

proper application has been determined, and then, only after keeping in mind the distinctions between corporate and military management.[8] It is the contention of this writer that the new relationship of the Chief of Naval Operations no longer makes possible a clear contrast between the corporate and military manager. In fact, the profit motive of the corporate manager and the economic motive of the military manager make for a compatible, closer kinship.

In the Office of the Chief of Naval Operations the strategic planning of the Joint Chiefs of Staff first becomes implemented in the Navy.[9] As defined, this implementation of policy is the management function. The practice of management includes the task of making military decisions which can no longer be divorced from the job of economizing. The management of these resources need special tools and techniques to ensure optimization. Many of these devices are adaptable to military management.

These ideas then are the parameters of the problem which is under observation in this thesis. The boundaries are not set because they do not form an island of action surrounded by a moat which makes the island look like a whole problem. Rather the parameters are flexible; and where they mesh with

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[8]David Novick and G. H. Fisher, "The Role of Management Tools in Making Military Decisions," Armed Forces Management, II (September, 1956), pp. 42-44; III (October, 1956), pp. 12-14; IV (November, 1956), pp. 25, 34-39.

[9]Infra., p. 25.

other duties and responsibilities in the organization of the Navy Department, these factors will be examined also. In business management the duties of the production manager, the financial manager, the sales manager, research and development manager, and others have a bearing on one another. The examination of one of these areas only focuses the problem and does not imply that it will be studied in complete isolation. In fact, the effort in this paper is toward a vision of the whole and not a narrow focus in order to arrive at a "how to do it" solution.

It is felt that the association of these ideas is related, however, and that if other frames of logic are built in a similar manner, a structure of the whole may be developed which will become more meaningful. Perhaps there will be questions left unanswered or even factors ignored, but these faults are not as serious, it seems, as complete disregard of the old situation which modern theory already has demonstrated to be obsolete. Some of the former principles of management fail to support the concepts of management today.

But the point is to improve! Start somewhere and carry the theory and logic to a conclusion. This objective is illustrated in this thesis. It is hoped that it will stimulate others who are better qualified, better informed, more creative, more ingenious to coordinate and to correlate the theory and the practices so that a better job can be done by the mightiest Navy in the world--the United States Navy.

The advice from the operating managers that, "you have not studied all of the problem," or "the problem is much bigger than you have indicated" may be valid. But let us make sure that the criticism is made honestly and not to avoid change or to belittle. In an address before the Seventh National Conference of the Armed Forces Management Association, Mr. Elmer B. Staats, Deputy Director, U. S. Bureau of Budget, pinpointed this thought:

> If there is one paramount problem in tackling management improvement, I believe it is the problem of how we go about structuring our improvement effort. We consistently set it up on a staff activity, exposed to the hurricane force of entrenched operating resistance, and we never seem to understand why it doesn't get very far. I hope we're finally learning that staff-level management improvement is just the icing on the cake; the nourishment and flavor is in the cake itself. The role of the staff management arm should not be to force improvement; it should be there to guide and assist the operating managers who themselves have the urge to find better ways of doing their job.[10]

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[10] Elmer B. Staats, "Good Management--For Better Government." Address before the Seventh National Conference of the Armed Forces Management Association, Washington, D. C., February 28, 1961.

CHAPTER I

EXTERNAL PRESSURES AFFECTING NAVY MANAGEMENT

In this chapter we shall examine some of the external factors which have been and are now affecting Navy management. Although it would be possible to trace these influences back many years, the trend since World War II will be briefly discussed; then the current situation will be highlighted. It will be noted that many changes in administration, management, and organization have taken place. It is these changes which have given the Chief of Naval Operations a different relationship in the military establishment. The reader should bear in mind the distinction between his title as Chief of Naval Operations, which is being studied here, and his position as a member of the Joint Chiefs of Staff. Finally, it will be observed that greater emphasis is being placed on the meaning of efficiency and economy in the Department of Defense.

Trends Since World War II

Since World War II, many and varied pressures which affect the management of military services have been developing. One of the first steps toward closer military supervision and management was the National Security Act of 1947, which provided

> for a Secretary of Defense; for a National Military Establishment; for a Department of the Army, a Department of the Navy, and a Department of the Air Force; and a coordination of the activities of the National Military Establishment with other departments and agencies of the government. . . .[1]

The duties of the Secretary of Defense were to exercise general direction, authority and control over the departments; to establish general policies and programs for the National Military Establishment, to eliminate unnecessary duplication in the fields of procurement, supply, transportation, storage, health, and research; and to supervise and coordinate the preparation of the budget estimates of the departments. It is seen that, at first, his duties were fairly general and without force because the act also provided the Secretaries of the Departments direct access to the President, essentially because they maintained their cabinet status.

In 1949, this weakness in authority of the Secretary of Defense over the departments of the military services was changed by the National Security Act Amendments of 1949, which primarily reorganized fiscal management in the National Military Establishment to promote economy and efficiency.[2] This act also reduced the status of the military services from executive departments to military departments (no cabinet status), and at the same time established the Department of

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[1]U. S., Congress, National Security Act of 1947, Public Law 253, 80th Cong., 1st Sess., p. 1.

[2]U. S., Congress, National Security Act Amendments of 1949, Public Law 216, 81st Cong., 1st Sess., p. 1.

Defense with the military departments subdivisions thereof. The identified duties of the Secretary of Defense provided that he have direction, authority, and control over the Department of Defense. To assist him in exercising these duties, the act also provided for the Joint Chiefs of Staff, Armed Forces Policy Council, Munitions Board, Research and Development Board, Deputy and three Assistant Secretaries of Defense, and establishment of a Comptroller of the Department of Defense.

But this centralization of power was still not enough to accomplish the purposes of the President and Congress. In the Reorganization Plan No. 6 of 1953, all functions of the Munitions Board, the Research and Development Board and the Defense Supply Management Agency, and the Director of Installations were transferred to the Secretary of Defense.[3] The management of these boards was too ineffective, so that the functions were re-established in the office of the Department of Defense where three new Assistant Secretaries of Defense were provided. This concentration of policy formulation and management coordination in the Office of the Secretary of Defense, and the establishment of the planning functions in the Joint Staff instead of through executive directives of the departments reduced the secretaries of the military departments to the status of operational managers only.

The Reorganization Act of 1958 further stripped the

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[3] U. S., Statutes at Large, LXVII, Part I, pp. 638-39.

secretaries by placing the operational command of the land, sea, and air forces under the direct control of the Joint Chiefs of Staff, who received their directions from the Secretary of Defense. This change greatly strengthened the authority, direction, and control of the Secretary of Defense. The act provided, in part:

> . . . for the establishment of integrated policies and procedures for the departments, agencies, and functions of the government relating to the national security; . . . for the establishment of unified or specified combatant commands, and a clear and direct line of command to such commands; . . . more effective, efficient, and economical administration in the Department of Defense; . . . for the unified strategic direction of the combatant forces, for their operation under unified command, and for their intergration into an efficient team of land, naval, and air forces but not to establish a single Chief of Staff over the armed forces. . . .[4]

If the reorganization in 1953, made only operational managers of the service secretaries, it would seem that this change in 1958, left the Navy Secretary merely a manager of the naval assets. Strategic planning and operational command are vested in the Joint Chiefs of Staff; and policy formulation and management coordination are concentrated in the Office of the Secretary of Defense. To appreciate the full impact of this 1958 law observe, in amplification, the language in section 5(j):

> With the advice and assistance of the Joint Chiefs of Staff the President, through the Secretary of Defense, shall establish unified or specified combatant commands for the performance of military missions, and shall determine the force structure

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[4] U. S., Congress, Department of Defense Reorganization Act of 1958, Public Law 85-599, 85th Cong., 2nd Sess., p. 2.

> of such combatant commands to be composed of forces of the Department of the Army, the Department of the Navy, the Department of the Air Force, which shall then be assigned to such combatant commands by the departments concerned for the performance of such military missions. Such combatant commands are responsible to the President and the Secretary of Defense for such military missions as may be assigned to them by the Secretary of Defense, with the approval of the President. Forces assigned to such unified combatant commands or specified combatant commands shall be under the full operational command of the commander of the unified combatant command or the commander of the specified combatant command.[5]

Thus the Chief of Naval Operations, as senior naval advisor to the Secretary of the Navy, is no longer primarily an operational commander, but in reality he becomes an administrator of the support and logistic functions of the Navy Department to ensure that the naval component commanders have what they need, where they need it, when they need it. Figure 1 clearly demonstrates the chain of operational command through the Joint Chiefs of Staff and the chain of administrative command via the Secretary of the Navy and the Chief of Naval Operations. The Chief of Naval Operations appears by himself only in the line of Navy support. Wearing this hat it is evident that he is no longer responsible for Navy decisions which are purely strategic. Instead, his planning will support the strategic decisions determined by the Joint Chiefs of Staff and provided to him via planning guidance. Ultimately, we shall see that the end-product of all Navy planning is to provide and support the forces--ships, aircraft, weapons, and men with which our commanders fight.

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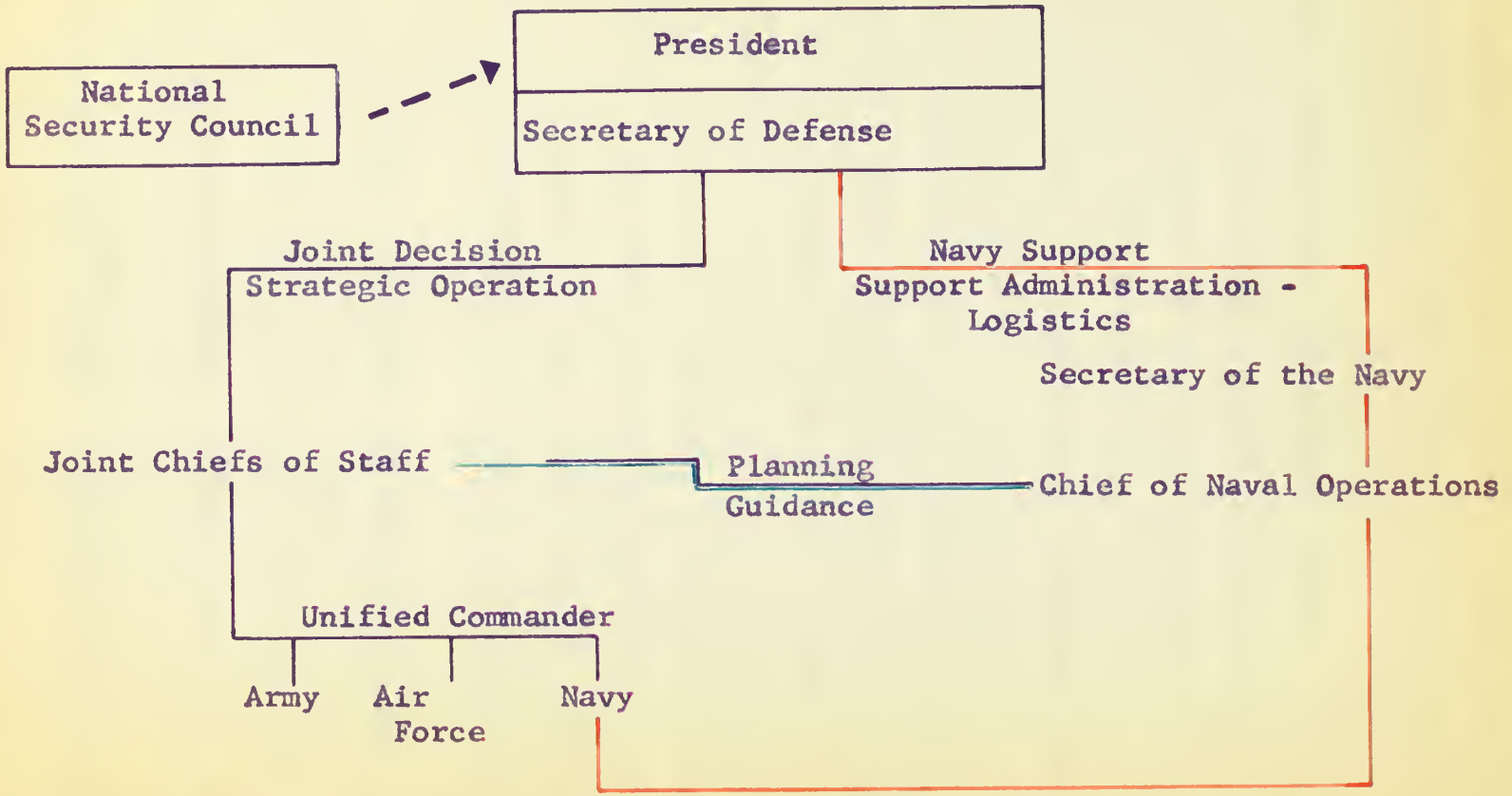
[5] Ibid., p. 5.



Blue line represents chain of strategic and operation authority.
Red line represents chain of administrative and logistic support.

Navy Planning--Strategic and Support

Figure 1

Current Trends in Management

To dramatize the present attitude of government officials toward this concept, let us briefly interpret some actions which have taken place since President Kennedy took office on January 20, 1961. On February 20, 1961, President Kennedy abolished the Operations Coordination Board.[6] This board was a high-level, secret group created in 1957, to implement decisions of the National Security Council. One of the functions of the Deputy Chief of Naval Operations (Plans and Policy)--the principal naval strategic planner--was to provide for coordination of staff support on the National Security Council, Operations Coordination Board, Mutual Defense Assistance Program, and Armed Forces Policy Council matters.[7] With the elimination of this board the Chief of Naval Operations now receives his coordinative action assignments, not through the OCB, but from the Secretary of Defense via the Joint Chiefs of Staff. This action was described as part of Mr. Kennedy's program to "streamline the policy-making machinery by scuttling some of the hundreds of inter-agency committees now in existence."[8]

Secondly, Secretary of Defense Robert S. McNamara continued this trend toward coordinating action and planning

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[6]The Evening Star (Washington, D. C.), February 20, 1961, p. A-4.

[7]U. S., Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 5430.2B (May, 1958).

[8]The Evening Star (Washington, D. C.), February 16, 1961, p. A-5.

Current issues in economics

under the Joint Chiefs of Staff by reducing the activity of the Armed Forces Policy Council to a "when called" basis. This council advises the Secretary of Defense on matters of broad policy relating to the armed forces and considers and reports such other matters as the Secretary of Defense may direct.[9] The announced reason for the reduction in the frequency of meetings of this council was to improve efficiency by directing these broad policy matters to the three service secretaries for immediate personal comment. These two and other actions of the Kennedy-McNamara team will bring greater military unification by curbing duplication and interservice rivalries.[10]

Another action by Mr. McNamara is his establishment of an office for management and organizational planning in the Department of Defense.[11] At the same time, he abolished two assistant defense secretary posts, reducing the number of Presidential appointees who report directly to him.[12] Figure 2 shows the present organization of the Department of Defense.

It is known that Mr. McNamara has strong ideas about management, which he intends to apply. In fact, he is

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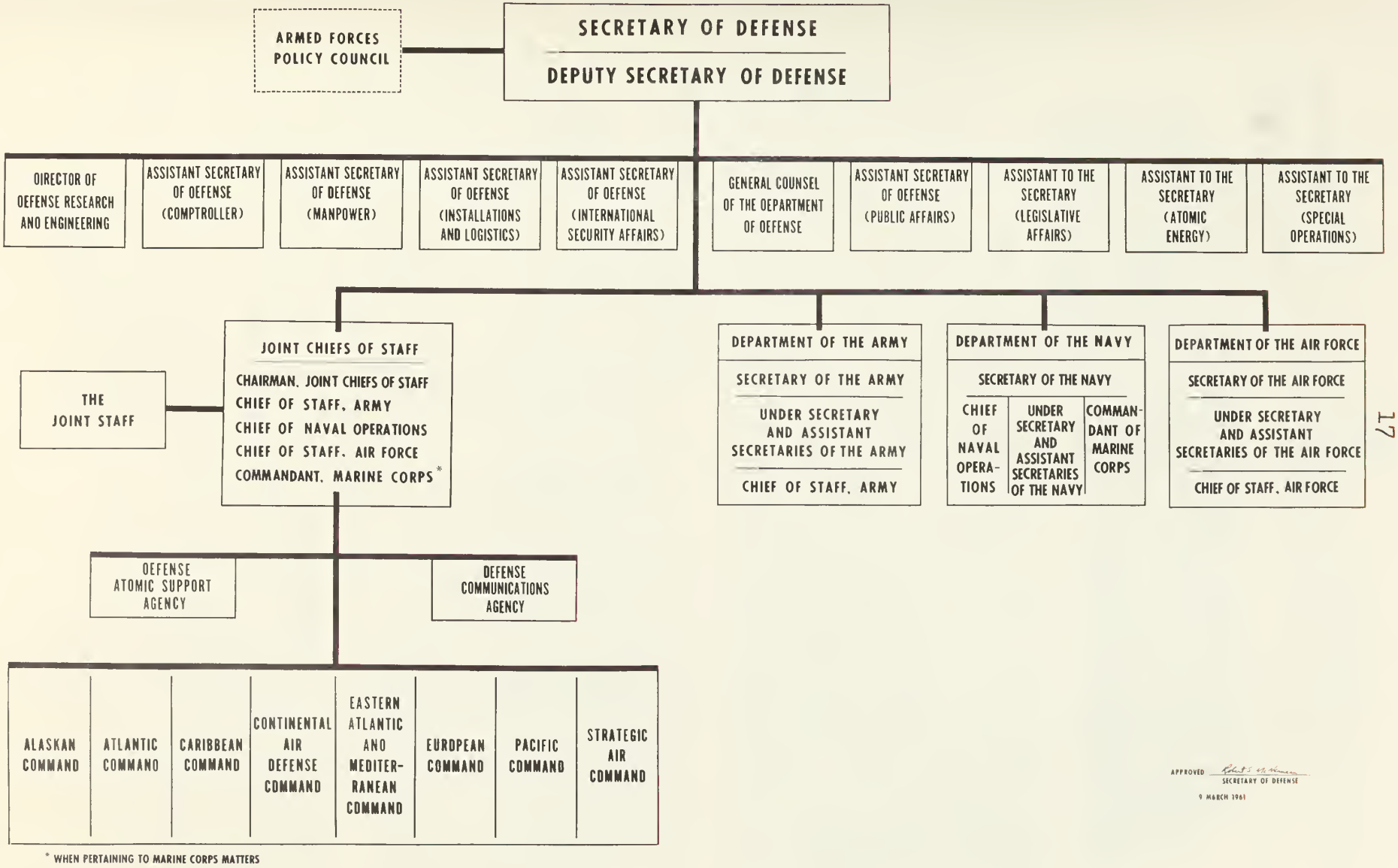
[9]U. S., Department of the Navy, Bureau of Naval Personnel, Organization for National Security, NavPers 10795 (April, 1955), p. 7.

[10]The Wall Street Journal, March 20, 1961, p. 1.

[11]U. S., Department of Defense, DOD Directive Number 5145.3, "Responsibility for Management and Organization Planning Within the Department of Defense," January 30, 1961.

[12]Those posts eliminated were: Assistant Secretary of Defense (Properties and Installations) whose duties were absorbed by ASD (Supply and Logistics); and ASD (Health and Medical) whose functions were assumed by ASD (Manpower and Personnel).

DEPARTMENT OF DEFENSE



* WHEN PERTAINING TO MARINE CORPS MATTERS

APPROVED
SECRETARY OF DEFENSE
9 MARCH 1961

Figure 2

characterized in a recent Business Week article as a professional manager:

> A look at McNamara's record brings out the portrait of a top-grade professional manager able to apply his administrative talents to any institutional management problem. He is a prize specimen of a remarkable breed in U. S. industry--the trained specialist in the science of business management who is also a generalist moving easily from one technical area to another.[13]

It seems likely, therefore, that the trend commenced by the National Security Act of 1947, is gaining momentum under the new Secretary of Defense. As he apparently sees it, unification means assuring that the services do not have overlapping functions and that they employ common approaches to strategy, logistics, administration, and management practices.

Efficiency and Economy

In addition to the management impact on planning there is another closely related attitude--the impact of defense spending. In the Business Week article previously quoted, the point is made: "McNamara believes major decisions should be based as often as possible on quantitative analysis, or on economic analysis measuring costs in relation to strategic gains and alternative decisions."[14]

Mr. McNamara is not a big spender; he sees with the eye of an experienced comptroller (a post he held at Ford Motor

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[13]"'Pro' Manager Takes on Military," Business Week, February 11, 1961, p. 98.

[14]Ibid., p. 106.

Company in 1949). To support him in his drive for efficiency and economy, he has selected Mr. Charles J. Hitch, former chief economist of the Rand Corporation, as comptroller in the Department of Defense. As one of the two authors of The Economics of Defense in the Nuclear Age, Mr. Hitch is known to believe that all military problems are economic problems insofar as they involve the efficient allocation and use of resources. To demonstrate the closeness of the McNamara-Hitch concepts, Mr. McNamara has appointed Mr. Hitch to head a special study group to review the strategy for all-out-war with greater emphasis on wartime survival of missiles and bombers and less emphasis on sheer number. Mr. Richard Fryklund, a staff writer for The Evening Star newspaper, when reporting on the Hitch study group stated

> . . . Mr. McNamara is not looking for a basic big-war policy, but for quick changes that can be worked into his first budget request and for a broad strategic war philosophy which can be translated later into a specific administration position.[15]

Here, then, we see the close relationship of economics and defense.

Another factor which is related to efficiency and economy is the establishment of a new post entitled Deputy Assistant Secretary of Defense (Comptroller) for Programs. Mr. Hitch was influenced in this decision by Dr. Dave Novick of the Rand Corporation, who is a strong advocate of program

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[15] The Evening Star (Washington, D. C.), February 15, 1961, p. A-10.

analysis.[16] The new Deputy is Mr. Hugh McCullough, formerly in the Office of Analysis and Review in the Navy Department. Mr. McCullough's selection implies that Mr. Hitch will rely on new scientific methods to ensure balance in the Department of Defense programs and to measure the degree to which those programs support the national strategy. It is also fair to assume from reading Mr. Hitch's book that these budget programs will have a different relationship to long-range planning than has been used in the past. In discussing the indicators of performance--the programs, the authors imply the need for improvement in the statement, " . . . long-range planning and also programming have been in terms of military units, but budgeting (that is, translating the programs into costs) has usually been in terms of other categories."[17]

Summary

If in 1961, we think that an $80 billion Federal budget is a staggering sum of money, the Bureau of the Budget experts are already talking about $100 billion of annual spending by 1970.[18] These additional billions are not expected in defense spending but rather in programs for relief, health,

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[16] David Novick, "A New Approach to the Military Budget," U. S. Air Force Project Rand Research Memorandum, RM-1759 (Santa Monica, California: Rand Corporation), pp. ii-iii.

[17] Hitch and McKean, p. 61.

[18] "On the Way--Budgets of 100 Billion Dollars," U. S. News and World Report, February 20, 1961, p. 90.

schools and other welfare aids, space exploration, natural-resources development, economic aid abroad, postal service, and others. It is evident, therefore, that defense spending will become even more restrictive, more closely related to strategic planning. Military planners and management programs will need new tools and techniques to correlate objectives and costs. In order to grow stronger through expensive advanced technology, Navy planners must recognize these external factors which emphasize economic considerations and adopt management scientific methods which maximize defense at minimum costs. A study of the present Navy planning system will help us in understanding the need for these methods.

CHAPTER II

NAVY PLANNING SYSTEM

In this chapter is examined some of the complexities of long-range planning as it develops in the Office of the Chief of Naval Operations (OPNAV). To serve the purpose of this thesis, it will not be necessary to analyze the functions, responsibilities, tasks, or even the intricate structure of the Office of the Chief of Naval Operations in order to illustrate the point that planning and coordination of programs and dollars are presently too complicated to be effective.

Navy Planning

A terse but striking look at the Navy planning process was presented by Mr. Sid Freeman of the Navy Management Office when he wrote:

> Visualize a man just graduated as a master auto mechanic. Then put him in a car, and when the speedometer hits 70 mph hand him his tools and tell him: 'OK, get out there and overhaul the engine!'
>
> Ridiculous? Perhaps. But that's about what we ask of our planning staff in the Navy, who must prepare plans in a management environment that's in a constant state of flux. Most of our planning aids--most of the manuals and the textbooks--are built around the techniques of military operational planning, which is oriented around fixed points.[1]

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[1] Sid Freeman, "Some Important Considerations in Planning," Navy Management Review, V (November, 1960), pp. 12-13.

Mr. Freeman's contention is that the operational planning technique--highly developed and proven--has been borrowed and used for planning systems prescribed for continuous logistics-type operations, such as budgeting, procurement, personnel strengths, because it is the best understood approach. But a new approach is needed.

Planning is one process in the series of continuous and contiguous management cycles of planning, organizing, directing, coordinating, and evaluating. One of the most important elements of the Navy planning process is the translation of the task into action. This is the requirement of the program. A program is a system of administrative actions designed for the accomplishment of a definite objective. This objective, in turn, is derived from the program objectives which are definite statements of reasonably attainable goals planned for accomplishment during a specified time period.

Programming Plans

The program objectives in the Navy planning system are expressed in the Projected Program Objectives and Annual Program Objectives documents issued by the Office of the Chief of Naval Operations. The Projected Program Objectives are prepared by the General Planning Group. The Director of this division, "under the direction of the Vice Chief of Naval Operations, is responsible for coordinating the preparation of this document."[2] Six line divisions and four of the staff

[2]Department of the Navy, Office of the Chief of Naval Operations, "The Navy Planning System," OPNAV Instruction 5000.19A of 21 July 1960.

divisions (Figure 3) are charged with review of various segments of this document. These segments are derived from component plans prepared by nine of these same ten divisions (less the Long Range Planning Group) plus the Commandant of the Marine Corps, the six technical bureaus, and the Office of Naval Material. The Navy Projected Program Objectives provide for the coordination and integration of selected Navy programs during the five year mid-range period (Figure 4). The objective document is prepared to implement the missions and general tasks which stem from the National Security Act of 1947, as amended, and other national laws; functions of the Department of Defense and its major components; joint plans; naval policy; and other directives.[3] It includes operational and logistic implementation. No attempt is made to price the programs for this five-year period, although one of the inputs, the long-range objectives, is made with fiscal assumptions (Figure 5).

The annual increment of the Projected Program Objectives document which outlines the peacetime objectives and programs of the Naval Establishment in general terms and provides the broad basis for the formulation of the annual budget estimates for the fiscal year commencing 1 July eighteen months later. It is issued about 1 February with the General Planning Group again acting as the coordinating division.

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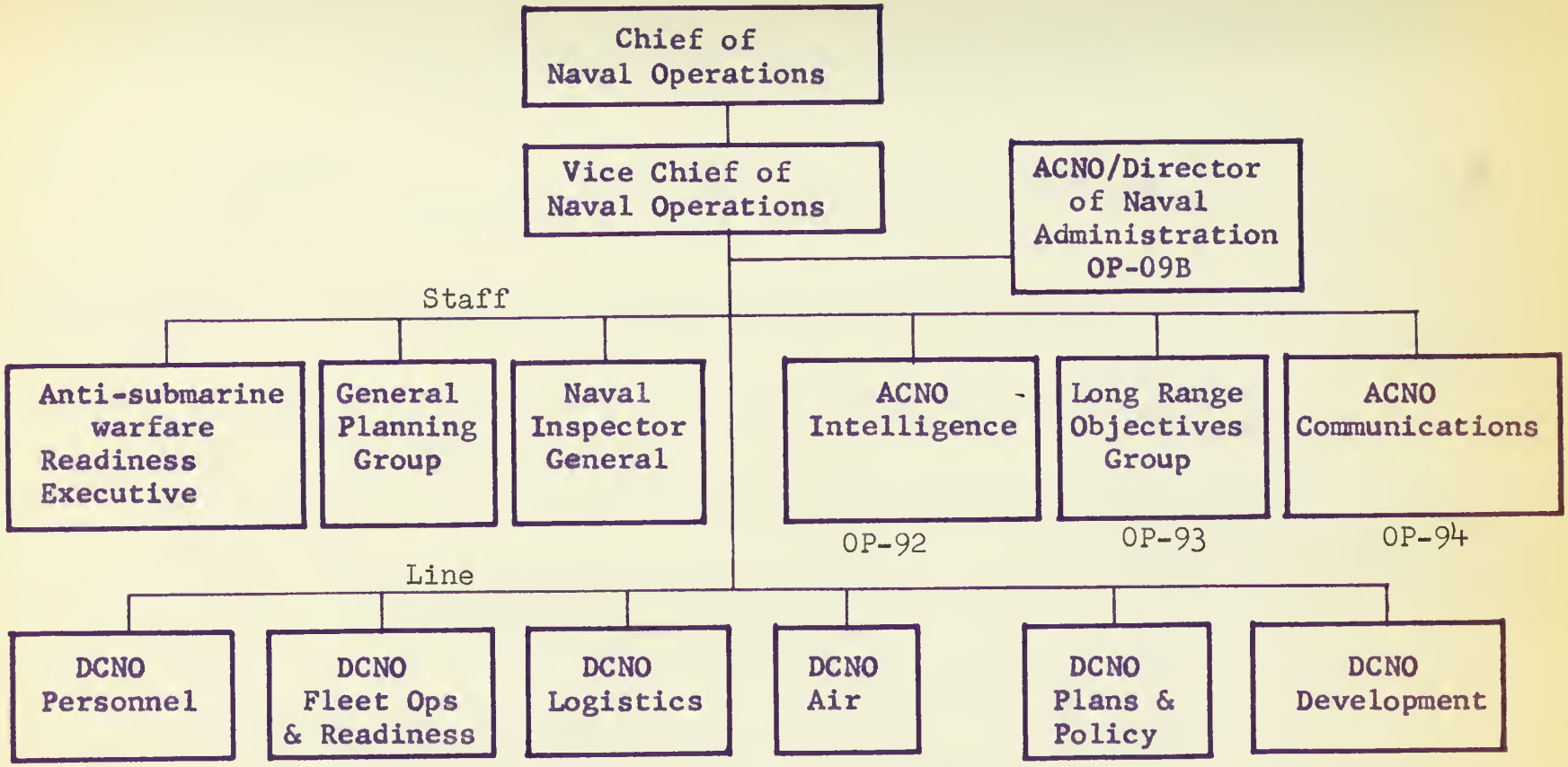
[3] Ibid., p. 1.



Projected Program Objectives: Cognizant parts reviewed by DCNO's plus Op-92, 93, 94, and Op-09B.

Projected Program Objectives: Component plans prepared by DCNO's plus Op-92, 94, and Op-09B; Commandant of the Marine Corps, Chiefs of BuShips, BuMed, BuWeps, BuS&A, BuPers, and BuDocks, and Chief of Naval Material.

OPNAV Staff-Line Organization in Brief

Figure 3

TIME RELATIONSHIP OF NAVY PROGRAMMING PLANS

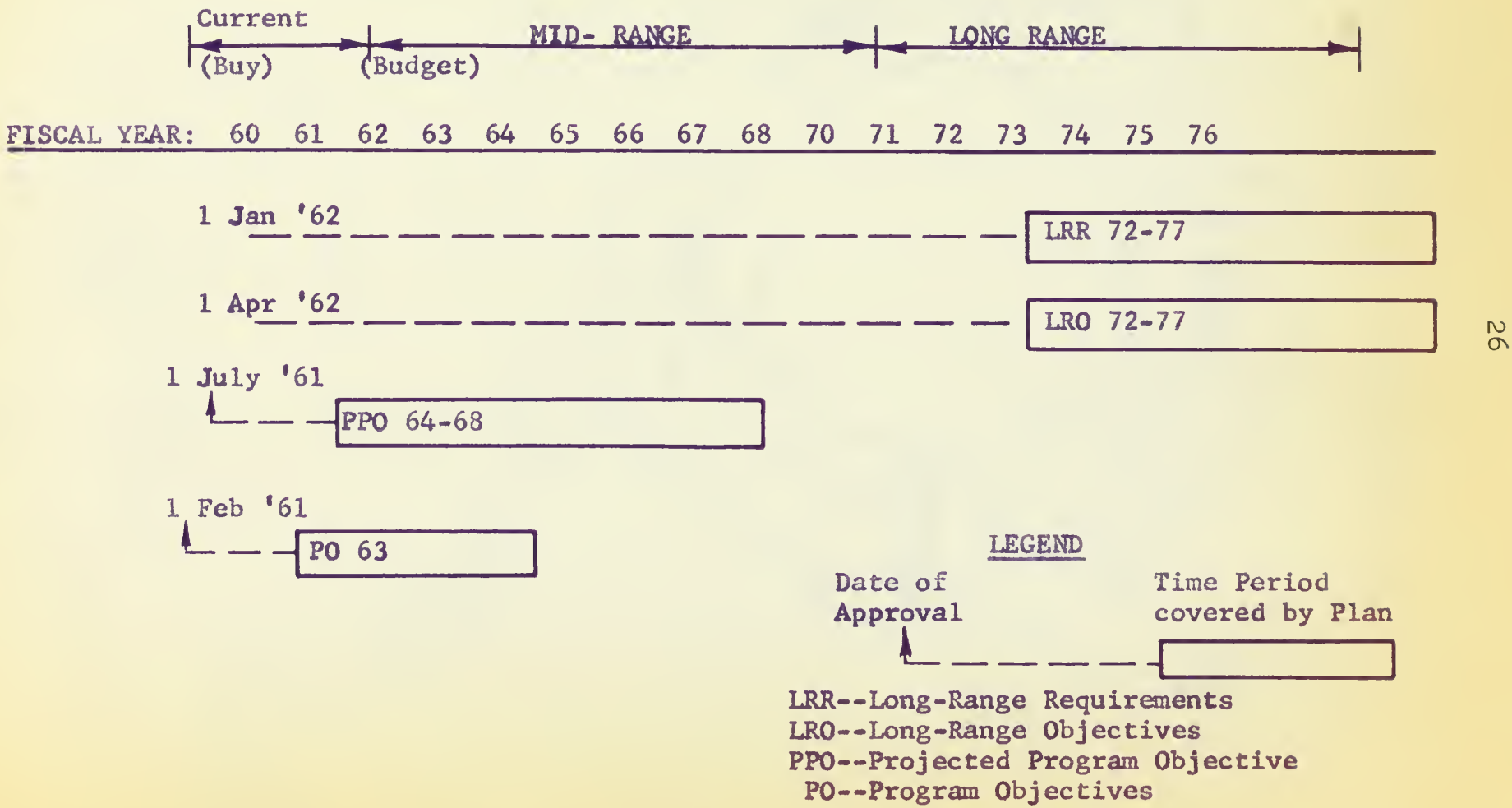
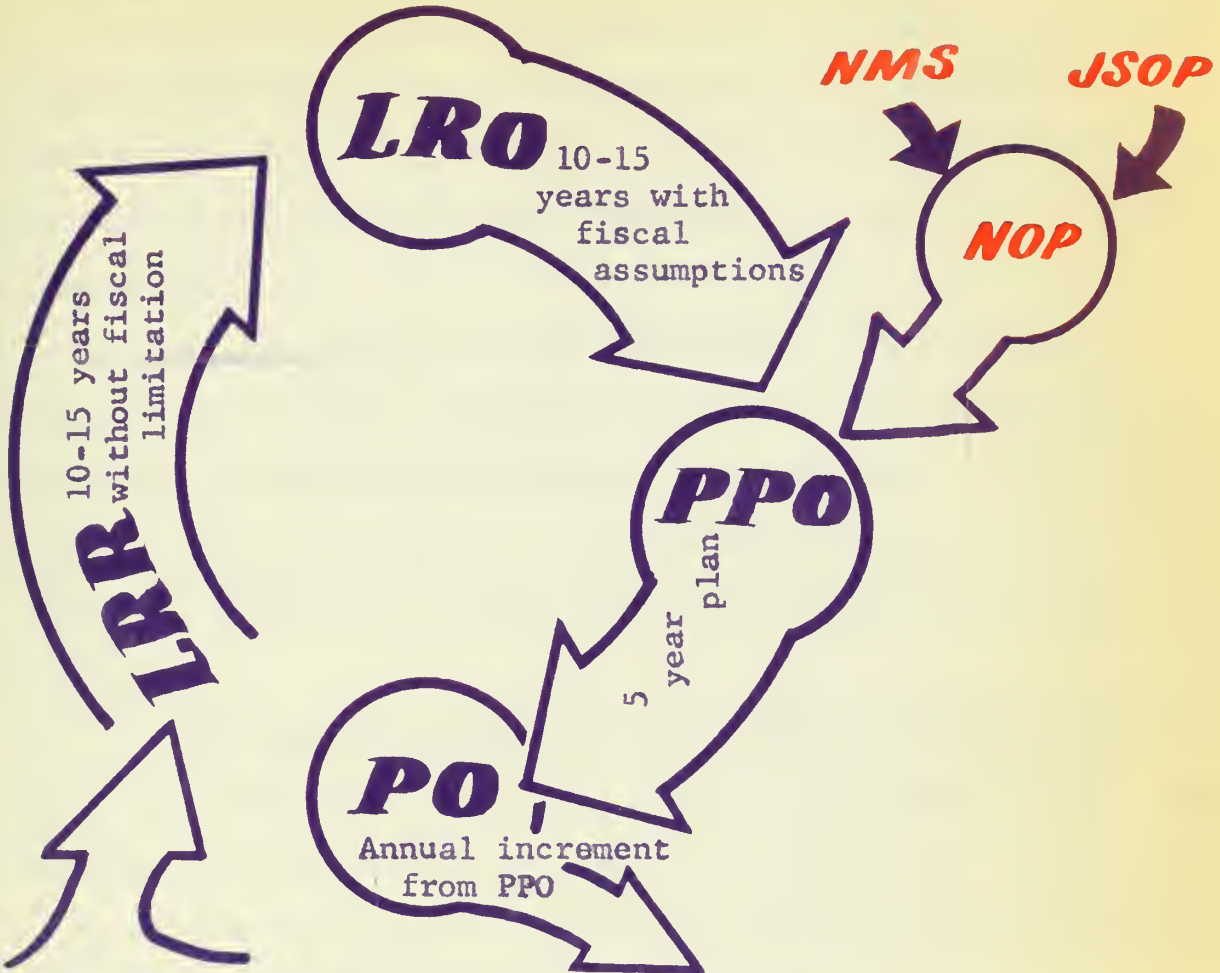


Figure 4

SCHEMATIC REPRESENTATION OF
SEQUENCE AND INPUTS TO PROGRAMMING PLANS



LEGEND

War Plans

NMS--Navy Mid Range Study
NOP--Navy Objective Plan
JSOP--Joint Strategic Objective Plan

Naval Establishment and Programming Plans

LRR--Long Range Requirements
LRO--Long Range Objectives
PPO--Projected Program Objectives
PO--Program Objectives
BNEP--Basic Naval Establishment Plan

Figure 5

With this over-simplified explanation of the Navy Planning System there are two salient factors to highlight:

1. The General Planning Group, as a staff division, is not responsible for making decisions when conflicting strategies, plans or programs, are presented, although to resolve conflicts they make suggestions to the line and staff divisions.

2. As stated at the beginning of this chapter a program is a course of action to achieve a specific result necessary for the fulfillment of a requirement. That requirement is generally stated in military terms or missions. The program, therefore, is the translation of the tasks into action.

The logical questions which arise from these factors are: Who makes the decision? Who does the translating? Let us address ourselves to the second question first because it will assist in analyzing the decision-making process later by knowing how the programs are developed.

In program planning alone there are essentially three levels of decision-making, which can be illustrated by defining the terms Program Sponsor, Program Coordinator, and Program Manager:

The Program Sponsors are the Commandant of the Marine Corps, the Deputy Chiefs of Naval Operations, the Assistant Chief of Naval Operations (Naval Reserve), the Chief of Naval Material, and the Director, Naval Petroleum Reserves, who

coordinate and integrate their particular programs.[4]

Program coordinators are representatives of the program sponsors. They are designated permanent working groups and are the liaison officers with the program managers in the bureaus and offices.[5] Many day-to-day decisions in executing programs are made by these officers.

Program managers are the officials responsible for the direct execution of a definite program or portion of a program.[6] They are usually located in the various bureaus and offices of the Navy Department (Figure 6).

Relationship of Programs to Programs Objectives

Program objectives are definite statements of requirements and are issued by OPNAV as guides for current and future planning by operating managers in the bureaus and offices. They establish in quantitative or qualitative terms what needs to be accomplished. These program objectives are requirements. A requirement is an expression of a specific demand generated by a strategic plan or strategic concept for products, services, or resources. Every program which is supported with men, money, services, and/or facilities is contained in the program objectives. One-year requirements for programs must be

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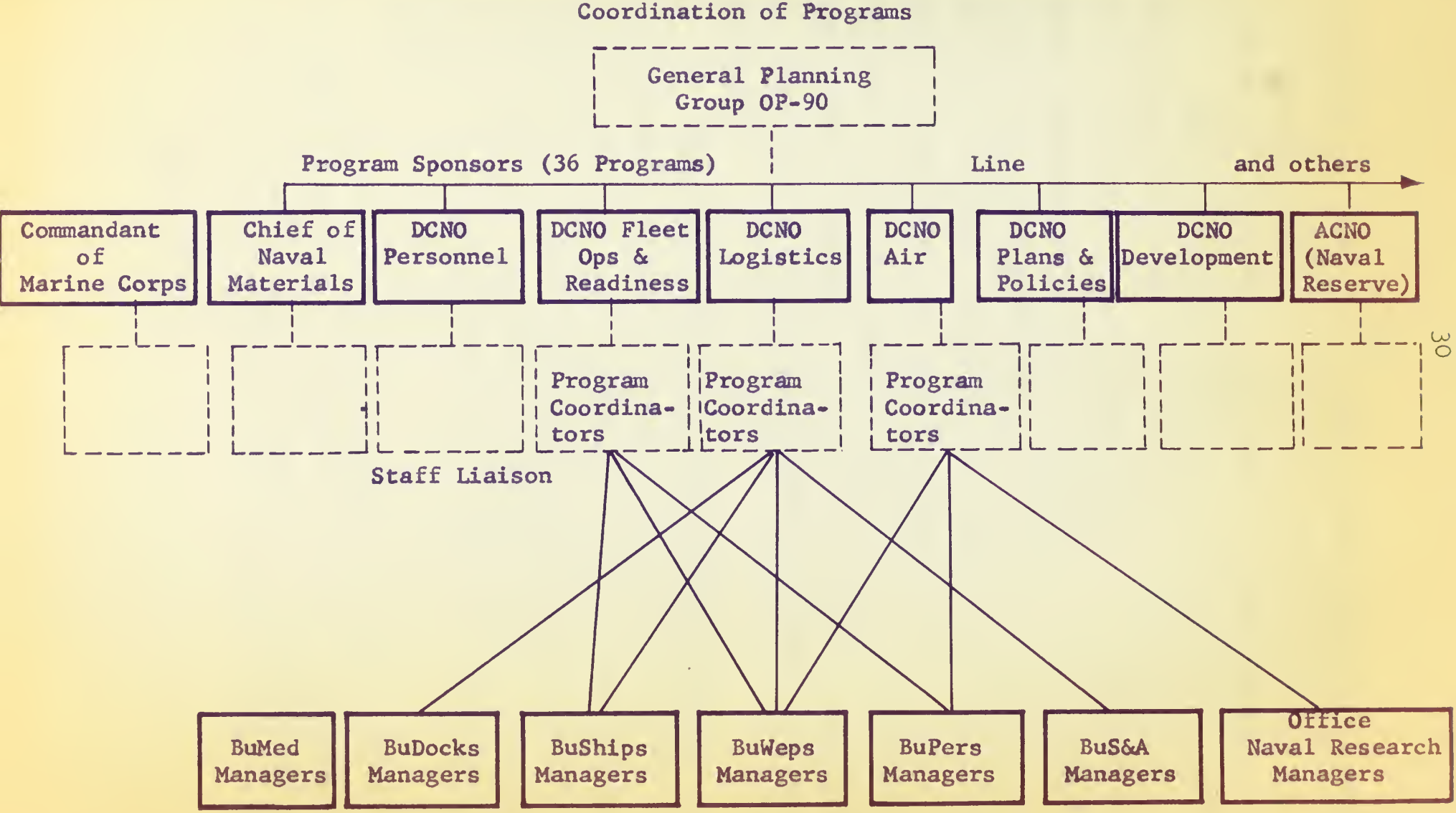
[4]U. S., Department of the Navy, Office of the Chief of Naval Operations, "Preparation of the Department of the Navy Annual Program Objectives (PO)," OPNAV Instruction 5010.17 of 23 Nov. 1959, p. Encl (3), p. 1.

[5]Ibid.

[6]Ibid.

RELATIONSHIP OF PROGRAM SPONSORS, COORDINATORS, MANAGERS



POSSIBLE INTERRELATIONSHIP FOR ONE PROGRAM

Figure 6

adequately set forth in the annual program objectives document in order that funding and personnel implications may be considered in perspective with all other requirements.

The annual program objectives include specific quantity objectives such as the combat units to be supported in the fleet; the number, type and designation of the operating and support vessels; the number of operating aircraft by organizational unit; numbers and categories of military personnel for the fleet and shore establishment; average number of steaming hours for the fleet; and similar guidance factors. The qualitative terms are general statements as to the level of maintenance of facilities, limitations as to the expected level of austerity; and other broad concepts to further guide the managers.[7]

Every effort is made to express these objectives in precise terms. However, because the area encompassed by each program objective is so broad and the goal that each is to achieve is so general, they become more mutually inclusive than exclusive. This lack of interrelationship is particularly evident in the program structure to which the objectives give rise.

The Program Objectives document presently includes about 36 specific programs. A program is a system of administrative action designed for the accomplishment of a definite objective.

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[7] Ibid., pp. 1-2.

Each of these programs is intended to support one or more of the program objectives. As such, they attempt to establish specific and detailed guidelines. However, the degree of explicitness is determined primarily by the degree of limitation that is inherent in the objective of the program.

For example, the polaris program has definite limits to its objective. Therefore, specific plans of action to achieve specific goals by specific times can be established. One of the criteria for establishing an objective is: if the necessary money is made available, the requirement program for a given year could realistically be produced in that time period using a peace-time industrial base and peacetime working schedules. In this polaris example the relationship to its program objective is direct. Other programs, in contrast, such as the active fleet maintenance and improvement program, electronics program, or the mine warfare program are not defined in such specific terms. Consequently, methods for achievement of these objectives are equally general.

Programs in such areas have only supporting implications in relation to the program objectives, since they usually affect more than one objective. While the program relationship to program objective is often indirect, the connection between programs is closely interrelated. For example, the shipbuilding and conversion program has as its formal objective, "to provide an adequate Navy for the future . . ." with emphasis on " . . . achieving a fleet ballistic missile capability; improvement in ASW capabilities; increased mobility and striking

power; and an adequate capability for amphibious lift, mine warfare, and fast mobile replenishment."[8]

We know, however, there exists another specific program (polaris program) with the purpose of achieving a fleet ballistic missile capability. Similarly, there are other specific programs in the field of anti-submarine warfare, mine warfare, and fast mobile supply support at sea. These programs are aircraft procurement, mine warfare, and underway replenishment, respectively. Thus, the explicit wording of the shipbuilding and conversion program reveals that this one program is closely related to at least four other specific programs and an indeterminate number of program objectives. The identification of the operating managers responsible for carrying out a specific program and the resources allocated for the achievement of a program are, therefore, serious problems for the program sponsor.

Before analyzing the problems of the program sponsor there are two points of focus to be noted in a preliminary way:

1. The first observation is that the polaris project is well-structured with finite parameters such as definite numbers of nuclear-powered submarines, definite numbers of missiles, finite time schedules, and other specific goals.

2. The second observation is that the shipbuilding

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[8] U. S., Department of the Navy, Navy Management Office, Financial Management Survey, May, 1959, p. 6.

and conversion complex is an ill-structured program with parameters which interact with many other tasks.

Problems of the Program Sponsor

Each of the specific programs has a designated OPNAV sponsor who is responsible for developing the statement of objectives and reviewing each proposed plan. His representative, the program coordinator, continuously reviews changes in light of new developments and techniques. Since a program such as anti-submarine warfare cuts across line functions of Operations and Readiness, Air, Logistics, and Development (Figure 6), more than one sponsor may be assigned to one program with one of the sponsors assigned the task of coordination. In one case the problem became so complex that in 1958, an anti-submarine warfare executive billet was created to provide the Chief of Naval Operations with special assistance in planning and direction of all matters pertaining to anti-submarine warfare readiness (Figure 2).

The difficulties inherent in the program objective and structure are largely overcome at the inception by means of personal contact and direct organizational and professional knowledge of the program coordinators. The planning system is therefore generally operative, though not as effective as could be desired. In the anti-submarine warfare example previously mentioned, the coordinator for air may receive planning estimates for program managers in the Bureau of Naval Weapons, Bureau of Naval Personnel, and Office of Naval Research for

details concerning aircraft procurement, personnel training, and compatibility of new detection equipment, respectively. His decisions are sent to the sponsor who bases overall decisions on factors from each of the other coordinators. For him to be knowledgeable about all details would be impossible. It is no wonder that stories circulate in the Pentagon that Admiral Burke "hit the overhead" when he learned that the latest electronic equipment for destroyers gathered dust in the warehouses because no one arranged for funds to install it. Although the story is hearsay, the probability is high that it or similar oversights could certainly develop in such a complex structure. This difficulty stems primarily from the multi-purpose role of the Navy's organization and from the planning system which was designated for an entirely different purpose.

Finally, the sponsor's knowledge of resources is complicated and limited by our appropriation structure. Parts of a program may be budgeted for in different appropriations or as different subheads in the same appropriation. For example, the electronic program is funded primarily from the "Ship-building and Conversion" subhead in the "Operations and Maintenance, Navy" appropriation; but it is also supported by other appropriations such as "Research and Development, Test and Evaluation." It is often difficult to determine how much is actually funded by each appropriation to support the total effort. This is an additional problem area which the program sponsor must face.[9]

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[9] Ibid.

As we have seen, the translation of the task into action requires the best thinking of staff and line experts at many levels of management. The objectives which set forth the various requirements cut across many lines of authority and responsibility in both OPNAV and the bureaus. Diversification, growth, and the interrelationships of the Navy Department--all of these add and continue to add to the complexity of management, to the proliferation of data and reports, and to the amassing of material for consideration in decision-making. Even the selection of material for the next reviewing authority is a decision-making process so that some decisions are being made at all levels. Eventually, when the resources (which may be represented by dollars) do not fully meet the requirements, the ultimate and most difficult of decisions is placed before the Chief of Naval Operations--top management.

The Resources Versus the Programs

When the time arises to match the available resources with the objectives, the fit is an obvious misfit. The program objectives may price out at $19 billion when the estimated available resources are more likely to be $12 billion. With the pressure of deadlines in the budget process, the problem is placed before the CNO Advisory Board consisting of the Vice Chief of Naval Operations, the six Deputy Chiefs of Naval Operations, the Chief of Naval Material, the Assistant Chief of Naval Operations (Administration), the Deputy Comptroller, a representative of the Commandant of the Marine Corps, and the

Assistant Chief of Naval Operations (General Planning) who acts as Secretary.[10] This board attempts to make the difficult decisions to fit the programs to the resources. The issues which they cannot resolve are referred to the Chief of Naval Operations and eventually the Secretary of the Navy for final decisions.

The CNO Advisory Board listens to the various sponsors (which include the Deputies and the Commandant) present their requirements to support the program objectives. Each justification is based on a synthesis of material facts. Ultimately, however, the board is faced with the decision of reducing, eliminating, balancing the planning factors to bring them in line with the dollars. It is a slow, difficult process which is a value, composite judgment of these officers. At times, only hindsight may prove them right or wrong. It is hypothesized that they must often wish that if only the questions placed before them could be phrased in a different manner, the alternatives for decision-making could be more realistically and clearly stated.

Summary

In tracing the complexities of long-range planning it is seen that there is a structural complexity and a complexity associated with the actions and decisions which make up the planning process. The structural complexity is caused by the

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[10]U. S., Department of the Navy, Office of the Chief of Naval Operations, OPNAV Instruction 5420.2C of 11 August 1960.

need to conform to an operational (consumer) organization in OPNAV and a producer concept through the bureau and office system of the Navy Department. Secondly, since the job of managing these programs has necessitated breaking them down into component parts to be acted upon by the bureaus, the principle of suboptimization has been put into effect so that the management of the whole is realized only by chance. On top of these two problems is superimposed the framework of the budget appropriation structure.

The ultimate result of this structural distortion is that the decision-making process becomes so complicated and involved that when the CNO Advisory Board or the Chief of Naval Operations takes final action, they are forced onto the horns of a dilemma. The choice leaves them "drawn and quartered" whichever decision is made. Since the growth of technology is so rapid, and since the cost of new weapons of war is so high, the decisions are bound to grow more burdensome.

Fortunately, the external pressures and changes discussed in Chapter I are forcing the Navy to reexamine its program planning. The reduction in the operational and strategic requirements will permit OPNAV to change its management to support to a greater degree the administrative and logistic requirements. In addition, the impact of Mr. Hitch's approach to the economics of defense will force new practices. Finally, it will be seen that the new tools and techniques of management make possible new building materials for accomplishing the tasks assigned. In the next chapter is analyzed the theory for the new management.

CHAPTER III

MANAGEMENT THEORY AND PLANNING

From Chapter I it is concluded that the need for the Chief of Naval Operations to concentrate on operational planning has been lessened by recent events and that economic factors are gaining increasing significance in measuring defense. In Chapter II it appeared that the present system of operational planning, which was adapted for logistic-type planning such as budgeting, has become too cumbersome for making sound decisions, which are no longer solely military decisions. This chapter develops the management theory which will enable top management to make decisions in a new environment.

Requirements for the Theory

The need for a new concept is already making planning extremely important. In a special feature section of U. S. News and World Report entitled "Washington Whispers" (items appear which are being talked about in Washington), the following brief note was reported:

> Defense Secretary Robert McNamara, if military officials are right, is having studies made, using cost-accounting methods, to determine the relative cost of putting a ton of nuclear explosives on target by bombers, by missiles and by Polaris submarines.

> The idea would be to determine which method gives the most for the money.[1]

It would seem, therefore, that the new management concept should incorporate a structure of logic which maximizes the economics of defense as a basic purpose.

Secondly, the system should be constructed so that the decisions of top management are presented in such a way that a number of alternatives are given so that political and psychological factors, which the human brain may best evaluate, may be considered in the analysis of alternatives. For example, if one alternative requires the closing of a naval installation, a factor which may be politically unpopular on Capitol Hill, the decision-makers can evaluate a slightly different alternative to avoid the closing or examine in detail the factors which justify the desired alternative. Thus, if the alternative is the best one militarily and economically, top management can concentrate its creative thinking on influencing the political side of the picture.

Thirdly, in order to develop the theory, we must practice empathy--imaginative projection of one's own consciousness into another being.[2] In this case, the other being is the Chief of Naval Operations whose thinking is oriented toward the military concept of need. And yet, he has

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[1] "Washington Whispers," U. S. News and World Report, February 27, 1961, p. 30.

[2] R. Adm. Lot Ensey, USN, Deputy Comptroller of the Navy, in an address before the Navy Graduate Comptrollership Program at The George Washington University, 7 October 1960.

to practice empathy himself to those at the Secretary of the Navy level and to the Department of Defense officials. Therefore, the system must be alert to factors outside his own office. The principal focus in this thesis will be, however, on the methodology at the OPNAV level so that in the next chapter we may examine some tools and techniques which may be used to do an orderly and systematic job of managing.

The Decision-Making Process

Although a prodigious amount of literature exists about the decision-making process, it is not the purpose of this paper to review or even to synthesize it. Rather the brief analysis of Dr. Peter Drucker will be adopted because in perspective it is applicable to the problem at hand. Professor Drucker determined the process to be analyzed in five crucial stages:[3]

1. Defining the situation. This is not problem solving, but rather it is finding the right question and then looking for a range of alternatives, each with distinct risks of its own and none completely solving the problem.

2. Determining what is relevant. This means a systematic effort to determine the measurement appropriate to the situation.

3. Determining the scope and validity of factual knowledge. Since factual knowledge in military situations is

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[3]Peter F. Drucker, "'Management Science' and the Manager," Management Science, I (January 1955), pp. 115-17.

often limited, the decision will involve risk because it is a decision for the future, and it will be based on imperfect knowledge even of the theoretical knowable situation.

4. Developing all the alternative solutions. Determining advantages and disadvantages, prospective gains, risks and costs, their effects, their impact and their timing.

5. Ensuring that the chosen solution is made effective in action. It is characteristic of the decision-maker's work that this action is (a) always human action, and (b) always action of other people. To be effective a decision must be both understood and accepted by others. An effective method of information is therefore required.

Without implying that this method of decision-making is either inclusive or conclusive, the following tentative invariants seem to be present:

a. It is primarily concerned with group decisions.

b. The act of decision-making is a sequential process.

c. It is explicit that the process recognizes the need to deal with multivariant dynamic systems of considerable size. These include generalizing from case studies based on observations, the utilization of an accounting system, the use of observations and interviews to construct simulations, and the employment of operations research techniques.

d. It implies certain nonrational aspects of decision-making which in some cases may be overcome by a restatement of the problem and by the design of measures of effectiveness.

If these constants are present (and it is hoped that they appear to be), then this theory of decision-making approaches the study of decision-making in various disciplines reported by Martin Shubik in his generalizations about the methods and substance of decision-making in a recent edition of the Administrative Science Quarterly.[4]

Next, what does the top manager need for decision making?

1. A strict method to be able to judge rationally and responsibly.

2. A strict method for the decision-making process as a whole.

3. An integrated process to determine relevant facts for a definite situation.

4. A "feed-back" from the results to the process to tell if the decision is effective or not.

5. A program of the whole with a logical structure that embraces the whole process and represents it logically, and a communication system to tie the parts and the whole system together.[5]

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[4]Martin Shubik, "Studies and Theories of Decision Making," Administrative Science Quarterly (December 1958), pp. 305-06.

[5]Drucker, Management Science (January 1955), pp. 117-18.

A New Philosophy

To achieve these objectives the Navy philosophy has been to issue more rules and regulations than are necessary so that with age and size the practice becomes a disease. Those who call themselves procedural analysts even try to anticipate needs. They make rules for individual occurrences and for situations that are largely nonrecurring. They have a passion for neat little packages. They adopt the mental set of the lawyer, which is antipathetic to good management. The lawyer likes to reduce everything to writing; the manager's instinct tells him to formalize as little as he can because management is constant change and efficiency is flexibility.[6]

Yet, if the organization is large or the management function is subordinate to the operational function, this philosophy may be necessary. After all, the principle of the span of control limits the number of workers that a manager can direct to some number between 4 and 11. This principle, therefore, implies an organization which appears like a tall, steep pyramid with a small base. But the principle of communication requires that the lines of communication throughout the organization should be short which makes the organization structure appear like a short, squat pyramid with a broad base. Obviously, these two principles of management are mutually exclusive so that the manager has tried to resolve

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[6] Cf., M. E. Dimock, A Philosophy of Administration (New York: Harper and Brothers, Publishers, 1958), p. 110.

these two opposing points of view by organizing for the principle of control and then issuing a myriad of directives to serve the principle of communications.[7] Neither solution fully serves the decision-making process of the manager.

The Structure of Management

The second point of focus then is the structure of the enterprise. In Chapter II was analyzed the structure of the Navy planning system, and it was noted with dismay its complexity. In many respects it may be likened to Dr. Drucker's nine dimensional structure of the business enterprise.[8] The Navy organization exists on three levels--each embracing the whole enterprise but neither, by itself, containing it:

a. The physical level as an organized aggregate of physical things such as ships, aircraft, missiles, and other end-products.

b. The economic level as an organization of economic values (end-products) for economic purposes (defense, national security) which will be measured by the abstractions of economic rationality (cost of weapons, assets).

c. The organization is a community of human beings joined together for common as well as for

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[7]For other illustrations of incompatible principles see H. A. Simons, "Some Problems of Administrative Theory," Chapter II, Administrative Behavior (New York: The MacMillan Company, 1947), pp. 20-44.

[8]Cf., Drucker, Management Science (January 1955), pp. 120-21.

individual purpose.

On each of these three levels the Navy organization always by necessity and simultaneously exists in three dimensions:

a. Actions and decisions are affected by internal forces and external environment. They must satisfy both internal and external requirements.

b. Actions and decisions must be based on their contribution to the performance and results of the entire Navy and must ultimately be judged by them. But they are carried out in parts.

c. The organization lives always and simultaneously in (at least) two time dimensions: the immediate future and the long-range future. Every action and decision affects both.

It is this structural complexity that is the unique problem of managing, and it means the following for the manager:

a. He can never manage by a single objective.

b. Every decision is aimed at bringing about action by people.

c. In every managerial decision qualitative--moral and spiritual--factors are necessarily part of the situation. (Political and psychological importance may be assumed here).

d. For the most difficult administration of the Navy managerial decisions should be based on a vision of the whole.

The basic problem of the manager in business or in the Navy is that he can no longer manage by suboptimizing and by hoping for the best. Indeed, unless he uses the tools that enable him to perceive the whole business in all its complexity, he will not be able to manage at all because of:

a. Technological developments in new weapons,

b. The increasing futurity of decisions, and

c. Stability and flexibility. Long-range decisions require the maximum of stability yet flexibility is required to make stability possible.

This concept of management of the whole strikes at the heart of the methodology which this writer proposes. A particular "mix" of aircraft purchases for the procurement appropriation may be optimizing the money available. But if this "mix" does not optimize the required number of anti-submarine aircraft needed for the anti-submarine warfare program or the optimum number of aircraft for the nuclear delivery program, the Navy program as a whole will suffer.

Socony Mobil Oil Company Example

Since there is a parallel in industry for this line of thought, a slightly extended discussion would be appropriate at this time. Mr. P. C. Salman of Socony Mobil Oil Company, Inc., addressed the Navy Graduate Comptrollership Course at

The George Washington University on January 5, 1961. After tracing the growth of Socony Mobil, he showed how a changing business world in the past ten years has necessitated internal change at Socony. It would be easy to draw an analogy between the increasing number of competitors and the keener competition faced by the company and the parallel situation faced by the military services. Perhaps the comparison is better shown by Mr. Salman himself when he stated:

> . . . Now just as the Navy has adapted to modern methods and techniques, Socony Mobil has recognized that changes in our management organization were necessary to modernize our Company. We felt that a new plan was needed which would enable us to take full advantage of today's better means of communications and improved techniques for analyzing and solving the problems that face us as managers of a world-wide enterprise. Improved accounting machines, electronic computers, and better communication and travel facilities, plus many other modern tools, have combined to make a SINGLE, WORLD-WIDE management structure advisable and technically possible.[9]

Fundamentally, Socony's reorganization combines the management responsibilities previously shared by several subsidiary companies into a single operating division called Mobil Oil Company.

> The practical effect of this action was to group in nation-wide operating departments each of the principal functions of our business, the management of which was previously being carried on by separate departments in Socony Mobil and each of its domestic affiliates.[10]

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[9] P. C. Salman, Comptroller, Socony Mobil Oil Company, Inc., in an address before the Navy Graduate Comptrollership Program at The George Washington University on 5 January 1961.

[10] Ibid.

It is seen that Socony Mobil's corporate management, therefore, functions on the basic philosophy of centralized policy-making. (This action parallels the Navy Department). But at the same time they did away with their structure of maximizing departmental profits and developed profit centers. Formerly, each major activity or function in Socony Mobil was considered responsible for running its own particular part of the business at a profit. To measure this profitability of the separate functions within the business, extensive use was made of inter-departmental billings.

By using this system of interdepartmental billing, it was thought that the motivation of the former functional management to maximize departmental profits resulted in the highest overall profits attainable for the Socony Mobil shareholders. However, in order for functions to have true profit responsibility, the functional organization unit should have complete decision-making authority on volume, price, and cost elements. Since they could not have this authority, it was considered both unfair and unreasonable to hold departmental managers responsible for profits.

In addition, this profit responsibility had the effect of diluting the functional manager's efforts by diverting their attention from the elements for which they alone were accountable: for example, in the case of a refinery manager, his primary concern should be refining expenses and efficient usage of crude oil and other import materials. Once it was decided that profit responsibility should not rest in each function,

it was placed in the profit centers at the division level.

Within the profit center, each manager, whether in marketing, manufacturing, or pipe-line transportation, is recognized as making contribution to the total profit of the complex either in the form of controlled or reduced costs or in the form of increased sales realization. This action also recognizes that any management affecting the operation should be viewed in terms of its effect on the total complex rather than attempting to analyze, as they had been doing in the functional profit and loss system, its effect on each separate department. One can see that there is great emphasis throughout the company on placing responsibility for decision-making in the hands of individual managers at all levels, giving them appropriate authority and yet holding them accountable for results.

Now how does this concept apply in principle to the Navy planners and managers? First, it might be well to point out that the Socony Mobil Oil Company in 1959 had sales and services totaling about $3.5 billions, from about the same total assets, in a worldwide operation, so that the size of the enterprise cannot be considered small even by Navy Department annual expenditures of $12 billions.[11]

Application of Theory to Practice

To retrogress briefly, it is reiterated that the facet

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[11] "Financial and Operating Statistics 1959," prepared by The Socony Mobil Oil Company, Inc.

of management which is under consideration here is the forecasting function. Management, of course, involves more than conceptualization and decision-making. The justification of management requires more than a mental activity--it involves action or the stimulation of an action in a more physical sense. In this light, management is viewed as a process, eventually measured in terms of group accomplishment.[12] But the restricted aspect of management envisioned is the employment of resources to accomplish predetermined objectives. It is felt, however, that the plan can be executed through the well-established channels of the "producer" system in the Navy by means of an adequate "feed-back" network.

Instead of having thirty-six or more program sponsors it is advocated that the managers be reduced to three. The first would be a manager for operations and maintenance of all weapons systems; the second would manage all procurement of weapons systems; and the third would be responsible for the support functions of these systems such as research and development projects, military construction projects, reserve forces, and general administrative functions.[13]

In the connotation used here a weapons system complex is a philosophy of management approach which emphasizes the

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[12] Cf., U. S., Department of the Air Force, The Management Process, AFM 25-1 (September 1954).

[13] Infra., p. 89. This model is analogous to the one proposed by Mr. D. L. Jackson and discussed in Chapter V.

importance of timely integration of all aspects of a weapons system from establishment of the operational requirement through design, development, production, personnel training, operation and logistic support. At the top level of management represented by the three corporate managers, the lines of distinction between duties and responsibilities are not clearly fixed. Their corporate decisions, however, would determine the optimum distribution of resources to achieve the proper balance between the Navy of today and the Navy of tomorrow. In fact, their major concern would be the posture of the forces today and the need to allocate resources for the forces of the future. Their external sources of guidance would be the economic reports of the nation, the political climate in Congress, the posture of the other services, the current operational commitments, and the international situation.

Now, let us examine the advantages of this centralized management group, and then in the next chapter we shall develop some tools and techniques for these managers so that they can shoulder this tremendous task. These advantages are not all inclusive but they will show how they support the theory.

1. It permits the development of a program of the whole with a logical structure.

2. It incorporates a "feed-back" from the results of the process to measure the effectiveness of the decisions. (This part of the system is touched upon in subsequent chapters).

3. It is an integrated process to determine relevant facts. A weapons system is not just aircraft, ships, missiles,

or any one end-product. It is a whole objective. Thus the parochial interests of one weapon proponent does not dominate the resources.

4. The strict method for the decision-making process will be developed through the use of management science tools.

5. It permits stability but also provides for flexibility when new developments occur. It also provides elimination or phasing out of weapons systems as they become obsolescent and are replaced.

6. The solutions are predicated on examining the range of alternatives, each with its distinct risks.

7. It ensures that the chosen solutions become effective in action.

8. It permits the preparation of reports showing actual performance versus planned performance. (This point will be illustrated later).

9. Top management is placed in the position where responsible managers can be directed to reduce costs in certain areas over which they have control. Thus, the former blanket plea for reducing expenses is exchanged for a sharp instrument of control.

10. By orienting the "complex" around the weapons system it facilitates comparison with the other services. If the weapons system has a dual capacity for nuclear and non-nuclear war, it may be analyzed in both categories or singly.

Summary

Beyond the routine, day-to-day actions of the Chief of Naval Operations are the decision-making or planning activities. More and more these activities are becoming increasingly difficult because of the advances in technology and the associated rise of costs in the development, procurement, and operations of weapons systems. Over the last 10 years the lines of battle in the Navy Department have been drawn. The value judgments of top management up and down the chain of command have been drawn taut in trying to resolve insolvable problems.

A new approach to planning is needed. Questions must be developed which transpose the normal or conventional thought processes. Questions must be developed which cross the known battle lines of fixation. Questions must be developed which permit a range of alternative solutions so that one weak decision does not cause irreparable harm.

Except at the very highest management levels most decision-makers reserve only a fraction of their effort for thinking and planning.[14] By far the largest proportion of their time is spent in mechanical, routine, and repetitive actions. There is a need, therefore, for a triumvirate of managers who have a vision of the whole to plan and guide the logistic-type

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[14] Cf., Burton V. Dean, "Application of Operations Research to Managerial Decision Making," Administrative Science Quarterly (December 1958), p. 414.

operations which are rapidly becoming the main functions of the Office of the Chief of Naval Operations. The future Navy must be planned today. The parts must be closely integrated to achieve maximum efficiency in the use of resources.

In the next chapter we shall analyze the tools and techniques available to assist this group of managers. Some of the precious principles of management of yesteryear will be cast aside, and in their place we shall substitute more powerful tools. These tools make it possible for a manager to encompass more of the problem area and rely less on the limited capacities of human brain-power. Ultimately, the gray areas of doubt will come more into focus so that the creative genius of the military man will provide an improved national security at minimum cost to our resources.

CHAPTER IV

AIDS FOR PLANNING

In 1959, Mr. E. D. Dwyer, Chief, Navy Management Office, wrote: "If we wish to improve management, we should study management rather than computers."[1] In 1961, Mr. Dwyer said: "We do have management know-how, and it is this plus imagination and work that can produce a solution to our problem" (a position to portray intelligently our problems so that necessary action on a national scale can result).[2] In this chapter, is charted a course somewhere between these two ideas. Since it was concluded in Chapter III that a new approach to management is needed, it would seem wise to study the tools available to assist management so that the improved management takes full advantages of these tools. Also to be examined are some promising management techniques which have not yet been proven so that imagination and work on these techniques can be started. If the improvements are going to be put to practical use, no less than a five-year projection of ideas must be set forth because it takes considerable time to program computers

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[1] E. D. Dwyer, "The Computer Challenge," Navy Management Review, IV (August, 1959), p. 3.

[2] E. D. Dwyer, "Educational Program Session," An Address before the Armed Forces Management Association, Seventh National Conference, Washington, D. C., 28 February 1961.

and develop the details of the management sciences.

Present Uses of Management Science

Mr. John A. Beckett, Assistant Director of the Bureau of the Budget, in an address last May observed:

> The uses of computers may be put into five major categories: business management, science, engineering, military operations and intelligence. In the first of these categories, business management, we find that the trend in ADP utilization to date has been to concentrate upon the administrative type of system--such as payroll, personnel accounting, cost accounting, appropriation accounting, inventory accounting and the like--while the substantive operations of many of the agencies have been ignored or intentionally set aside for the time being. This kind of imbalance was to be expected. It is also to be expected that the agencies will do something about it soon.[3]

If we accept these categories rather arbitrarily, the inattention to business management computers in the Office of the Chief of Naval Operations may be analyzed.

In a report on the use of electronic data-processing equipment in the Federal Government, an inventory (as of 3 June 1960) of electronic computers in the Navy Department shows a total of 87 computers compared with 139 for the Air Force and 134 for the Army. Of these 87 computers OPNAV has one small, 650 IBM, which is used for flight activity status and naval intelligence.[4] This one small computer then is used for

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[3]John A. Beckett, Address before the Symposium on Integrated and Automatic Data Processing Systems, Federal Government Accountant Association, Statler Hilton Hotel, New York City, May 23, 1960.

[4]U. S., Congress, House, Subcommittee on Census and Government Statistics of the Committee on Post Office and Civil Service, Report on the Use of Electronic Data-Processing Equipment in the Federal Government, 86th Cong., 2nd Sess., 1960, Committee Print, pp. 84-85.

the dual purpose of business management and intelligence.

Like a balance sheet in accounting this inventory reflects the status at that moment. What is being done today or planned for tomorrow? To give a fair portrayal of the current thinking and doing, let us briefly look at two programs which are in various stages of activity in OPNAV. In the first place, an aircraft logistic data program is nearly completed. An interim report in November, 1959, is a good place to start because: (1) it shows what the problems were when the study started, and (2) it partially illustrates the management planning concept (on a smaller scale) envisioned in Chapter III.

The conclusions reached in the report based on initial interviews in the Aviation Plans Division (OP-50):

> (1) OP-50 provides the basic planning data required by the Integrated Aeronautical Program to all levels of Navy, OSD, Bureau of the Budget, and Congress.
>
> (2) There is no evidence, either within or without, of the existence of a system describing the exact flow and content of this planning data. (The integrated aeronautical program, OPNAVINST 4110.1 broadly defines the type of data CNO will furnish to the Bureau of Aeronautics and ASO.)
>
> (3) The lack of such a system and schedule has placed OP-50 in the position of providing their data to requesting offices in many forms and with multi assumptions included, with little control over its eventual dissemination for planning.
>
> (4) In many cases, one branch within OP-50 is unaware of program data developed by another branch.[5]

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[5] U. S., Department of the Navy, Navy Management Office, "Interim Report of Aircraft Logistics Data Study" dated 13 November 1959, p. 2.

The analysis of these findings indicated that the effort to develop projected aircraft programs should be in two phases. The first phase was to prepare a series of recommendations aimed at improving the immediate ills which were reached in the conclusions above. The second phase was

> . . . an examination of the feasibility of utilizing electronic data processing for the preparation of planned aircraft programs and the design of a mathematical model for the solution of an optimum aircraft program including allocation, procurement requirements, overhaul requirements and aircraft disposal.[6]

Today this second phase is in its final stage, so that soon a computer will contain the many factors which make up planned aircraft programs. It will be of assistance to the program sponsor. This action is a desirable advance, but it still incorporates the principle of sub-optimization in planning which is contrary to the vision of the whole.

The second example is only in the embryonic stage, but it is definitely oriented to the whole problem of planning. In order to relate the impact of this project and others, note these recent words of Mr. Hitch:

> What we need are more precise and comprehensive estimates of total costs of major weapon systems, other programs, and activities, related to each of the principal missions of the Defense Department. These estimates should include both initial investment and annual operating costs.
>
> In the case of a major weapon system, for example, the estimate should include all the costs of the system beginning with the original research and extending through development, production, deployment, and actual operation of the system. In terms of the existing budget structure, these estimates would

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[6] Ibid., p. 3.

> include all costs under the research, development, test and evaluation title, procurement, construction, operation and maintenance, and military personnel--to the extent that these costs can be identified and associated with a particular system. Furthermore, the time horizon of the estimate should extend over the entire life of the system, or at least well into the operating phase. Finally, the estimates should be made available to top management early enough in the life cycle of the system to be of maximum value in the planning and decision-making process.[7]

In Figure 5,[8] it can be seen that the Long Range Objectives Plan is used as a basis for development of the Navy's Projected Program Objectives and the Department of the Navy Annual Program Objectives. In Figure 4,[9] it is evident that these long-range objectives cover a period from 10-15 years in advance of current planning. Recently, a group of senior civilian scientists has been added to the Long Range Planning Group (OP-93) to develop studies to serve as aids to planning for the future Navy. These men will be interested in relating costs to long-range objectives so that better decisions can be made. A highly desirable weapons system may be compared militarily and economically with its competitors and then compared with other programs which also compete for the total resources available. As a simple illustration, a weapons system similar to the Polaris program would have to be funded within the fiscal limitations. Thus, since it may be necessary to

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[7] C. J. Hitch, Assistant Secretary of Defense (Comptroller), an address before the Seventh National Conference of the Armed Forces Management Association, Washington, D. C., March 1, 1961.

[8] Supra, p. 27.

[9] Supra, p. 26.

reduce other programs, this is the time to plan for these reductions and not during the frantic twenty-month period of the budget process. The range of alternatives analyzed and proposed ten years in advance will certainly improve management planning. The official document creating this group, called the Institute of Naval Studies, defines its mission broadly as:

> To assist the Chief of Naval Operations in forecasting the long-range requirements of the Operating Forces of the Navy for equipment, material, personnel, and supporting services. As appropriate, the Director, INS, conducts, coordinates, guides, and requests studies to serve as aides to planning for the future Navy. In the fulfillment of these duties the Institute will be given freedom to achieve the fullest possible objectivity.[10]

Long-Range Planning Techniques

Although the last example is not strictly a tool of management science, it is a technique for assisting top management in making decisions. Let us consider a technique which might incorporate the type of thinking required by the Long Range Planning Group. We shall relate the technique to the basic end-product, the weapons system.

To understand the significance and importance of long-range plans and programs, remember that modern weapon systems involve tremendous costs and their complete life cycle may extend over many years. I should imagine, for example, that the life span of the Polaris weapons system is about 25 years including the development phase, production phase, and first

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[10]U. S., Department of the Navy, Office of the Chief of Naval Operations, "Director, Institute of Naval Studies," OPNAV Instruction 5000.23A of February 2, 1961.

line inventory phase. The Air Force has one weapon system currently in its inventory, which has a life span of 22 years.[11]

Carl Freedman, who was Assistant for Financial Management, Department of the Air Force in 1958, and former President, Armed Forces Management Association, wrote:

> In recent exercises, Air Force programs and costs have been projected for a period of nine years. In presenting the plans and programs in mission terms, top management sees the time-phased impact of various proposals in terms of combat capability, force requirements, personnel requirements. Within each command area a breakdown is also provided by weapon system. Through the presentation of alternative plans and proposals, top management can evaluate the combat capabilities inherent in the various alternatives as well as the financial feasibility taking into consideration economic limitations.[12]

Mr. Freedman then presents two fictitious examples illustrating first the time period from fiscal year 1981-1989. Various weapons systems are introduced, others operated and supported, others phased out. The level of combat capabilities is graphically displayed as changes in weapon systems convert the Air Force into complex units. Then he selects one of the weapon systems, and in the time period FY 1958-1967 relates it to a program from research and development to personnel requirements, financial requirements, and facility requirements. Of course, the examples are oversimplified for illustrative purposes, but the basic technique is well founded.

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[11] Carl Freedman, "Long-Range Planning: A Management Function," The Office (February, 1958), p. 71.

[12] Ibid.

In conclusion, Mr. Freedman writes:

> . . . It should be noted in passing that the Directorate of Management Analysis in the Office of the Controller of the Air Force has been developing techniques and uses a high speed electronic computer for computations to support plans and programs for approximately five years. Significant procedural techniques have been developed, including the Trim System which provides a generalized system of computer routines.[13]

The Navy does have an overall plan for automatic data processing.[14] It covers a thirty-year period from 1940 to 1970. The thirty years were divided into six, five-year periods. Stage 5 (the period 1960 to 1965) has eight ways which will characterize this period. One of these ways is the " . . . shift in emphasis of applications toward the best use of ADP predominantly in development of plans, programs, budgets, schedules, and management control actions. . . ."[15] Incidentally, Stage 6 (1965-1970) is a consolidation period and a period for rejoicing because we shall have achieved an integrated Navy management information system. It is difficult to accept this philosophy!

With 25% of the time period in Stage 5 already elapsed, a technique of developing the objective stated is undetected. The standard straight-forward approach adopted by the Air Force, we say, is not applicable to the Navy because our weapon

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[13] Ibid., p. 78.

[14] U. S., Department of the Navy, Office of the Secretary, Data Processing in Navy Management Information Systems, Sec-Nav Instr. P-10462.7, 16 April 1959.

[15] Ibid., pp. II-3.

systems, or ships, or aircraft are designed to function under many different circumstances; and, therefore, it is not possible to present plans and programs in mission terms. Thus the matter was dismissed! No attempt was made to construct a model to simulate the multi-purpose missions of the end-products.

This attitude may be too harsh but hardly unjustified in the face of the achievements of management science. As long ago as late 1957, Mr. Ellis A. Johnson of the Operations Research Office, The Johns Hopkins University, developed a philosophy of planning that applies to all parts of our military system and can be translated to cover other large scale operations. Mr. Johnson writes:

> . . . The goal is a planning system that provides in an orderly, logical way for a continuous and up-to-date search for solutions based on sound and timely decision-making instead of blind adherence to five-year plans. My proposal is not tied to any specific organization; rather it focuses on the functioning of a logical decision-making system within which long-range plans are developed.[16]

Although the thesis of Mr. Johnson's paper is not the wisdom which this writer desires to emphasize, the above quotation is the point of aim of this chapter. The decision-maker requires all the aid possible from advanced problem-solving procedures, such as operations research, which are now available. As yet, it appears that in 1961, at top management

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[16] Ellis A. Johnson, "The Crisis in Science and Technology and Its Effect on Military Development," Operations Research, VI (January-February, 1958), p. 29.

level too many decision-makers rely fully on the intuitive methods which were sufficient in the past when the problems of an enterprise were comprehensible to a single human being. It is especially true that the highly professional, hardthinking, imaginative planners who must screen ideas and proposals have the tools of science combined with intuition developed through experience in the various professional fields. As Mr. Johnson points out, these tools are particularly necessary so that the military planner knows which way to turn, what horse to put his money on, in the research and development area. Those ideas which appear fantastic, even ridiculous, today are reality tomorrow.

Promising Tools for Decision-Making

There have been developed many techniques for the methodology of management science. In fact, the Navy's slowness to adopt these techniques to management when they were used so extensively during and since World War II, remains a mystery which is difficult to explain. As an example, the minimax theory of mining grew out of World War II experience. In the operations against Japan, it was thought at first that saturation mining was necessary to bring the Japanese merchant marine to a standstill. As the months went by, however, it was learned that a few mines, well-placed could produce a larger number of casualties.[17]

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[17]Lieutenant Commander A. S. Lott, USN, Most Dangerous Sea (Annapolis: United States Naval Institute, 1959), pp. 223-28.

The principle of the minimax theory applied in a mining campaign is simple. The objective is to maximize enemy casualties (sink ships) with the minimum number of mines. Let there be no mistake, however, in believing that all of the variables are known or can be learned through naval intelligence! Indeed, there may be as many unknowns as a businessman faces in making up a sales forecast. But it is also true that good reasoning by the mining strategist will improve his results particularly at the beginning of the operation. As long as these variables remain within certain, rather broad, limits results are predictable.

To carry the mining illustration a step forward, the gaming theory may be employed. After the initial delivery of the mines, the reaction of the enemy is observed. If he follows one course of action--his option, the mining strategist counters by striking his most vulnerable places. When the enemy moves to cover those spots, others are mined. And so the gaming theory is played to exhaustion and ultimate starvation of the enemy country.

The advantage of this operational planning using operations-research methods is that any officer schooled in the basic principles may apply these principles, and under a similar situation any other officer may develop approximately the same end-result. Hence the element of chance is reduced, and the value judgment of an individual is subordinated to the overall objective. The same concepts are readily illustrated in antisubmarine warfare where the tactics for a

"lost contact" by a destroyer results immediately in going into certain search patterns based upon known factors such as the elapsed time since contact was lost and many variable, unknown factors such as the submarine's speed, course, depth.[18]

This paper does not purport to embrace operations research as a flawless science. There are many pitfalls. But every day these faults are being examined and in some cases solved. Again, an example of military operations is most easily described. Studies which relate to decisions affecting the course of possible military operations in the distant future are confronted by the familiar pitfalls of operations research in a particularly aggravated form due principally to the broad context in which such decisions typically appear. The alternative to the whole vision of the "broad context" is sub-optimization, which is as undesirable in military operations as it is in management long-range planning.

In a paper presented at the Sixteenth National Meeting of the Operations Research Society of America at Pasadena, California, on November 12, 1959, Dr. Douglas L. Brooks, of the Naval Warfare Analysis Group discussed means, (1) for avoiding undesirable sub-optimization, and (2) for including the effects of significant constraints when choosing criteria

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[18] Cf., Florence N. Trefethen, "A History of Operations Research," Operations Research for Management, ed. Joseph F. McCloskey and Florence N. Trefethen (Baltimore: The Johns Hopkins Press, 1954), pp. 3-35.

on which to base long-range planning decisions.[19] The long-range operations research philosophy advocated by Dr. Brooks was:

> . . . to research all things, develop many, and procure few. It is preferable to hedge your bets against the future rather than stake all on a purely fictitious 'optimium'. In long-range planning the best really is the enemy of both the better and the good. However, it is clear we cannot afford to look for the better or the good either in a 'grab-bag' or in a 'pork barrel'. Where we ought to look and how successful we are likely to be in finding what we need depend critically on the proper choice of pay-offs for the systems and forces being considered.[20]

Several new measures of merit are presented which emphasize the feature of research and development leverage over potential enemy countermeasure developments. For decisions affecting possible near-term military operations, it is suggested that operations-research studies can profitably emphasize the optimization of (a) deployment of existing forces, and (b) military decisions dealing with force compositions and systems development. The difference is particularly acute in the selection of criteria, or the choice of pay-offs, a matter absolutely critical for studies of military operations of the future.

In this discussion of the techniques of management science, there is pointed out the use of the minimax theory

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[19] Douglas L. Brooks, "Choice of Pay-Offs for Military Operations of the Future," Operations Research, VIII (March-April, 1960), pp. 159-168.

[20] Ibid., p. 168.

and game theory. There has also been set forth a concept of long-range planning based on a choice of pay-offs. It is interesting to note that these are the very ideas which Secretary Hitch may employ in management science techniques for balancing defense and resources. Mr. Hitch uses slightly different terms but essentially his methods for improving the indications of performance in the Department of Defense are similar. He describes them as: (1) changes in force structure, (2) the enemy's response, and (3) changes in designated capabilities.[21] It is felt that the reader can relate these factors to the thoughts expressed by Dr. Brooks.

With these quantitative approaches there is no doubt that Mr. Hitch will be faced with a multitude of alternatives when he makes his recommendations to Mr. McNamara. When one analyzes these broad concepts over a wide range of capabilities, weapons systems, resources, to name only a few, the range of alternatives becomes almost infinite. This means that the incorporation of these techniques will improve the present system of value judgments, but it will hardly solve the problem of optimum defense for a minimum expenditure of funds. Nor will the long-range planner reach his optimum objectives through quantitative methods.

One technique, however, for reducing the range of alternatives is to question the validity of operations-research studies. Since operations research is concerned with conducting

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[21]Hitch and McKean, pp. 61-64.

studies to help the decision-maker make better decisions, and since operations research deals with the future, it is in the nature of the decision process that there will always be uncertainties. Since the information on which decisions are based may be incomplete, the operations-research process may provide information to fill some of these gaps. An essay by Walter J. Strauss of the Institute of Air Weapons Research, University of Chicago, sets forth arguments that permit one to judge the reliability of the information provided by an operations-research study, that is, to judge its validity.[22]

Another approach to reducing the limitations or disadvantages associated with operations-research systems or analysis is presented by J. W. Ellis and T. E. Greene of The Rand Corporation. A known limitation in operations research is the nonquantifiable variables, such as political factors. Such variables obviously interact with the military factors in a complex fashion. The relation is dynamic so that political and military problems cannot be separated at times, and this relation changes continually throughout the course of a war. Mr. Ellis and Mr. Greene have examined a structured analytical method termed "contextual study," whereby the military and political factors of the environment of a limited war are

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[22] Walter J. Strauss, "The Nature and Validity of Operation-Research Studies, With Emphasis on Force Composition," Operations Research, VIII (September-October, 1960), pp. 675-93.

considered simultaneously throughout a campaign or series of campaigns.[23] Applications to other types of problems than limited war--problems involving close interaction among quantifiable and nonquantifiable factors are suggested. Several areas are mentioned in which a contextual approach would seem appropriate to problems involving strong admixtures of political, social, or psychological factors into otherwise quantitative situations.

We have now progressed from the conventional approaches suggested by the minimax theory and the gaming theory to refinements which avoid undesirable sub-optimization, to those which provide a means to judge the validity of operations research,and which incorporate quantifiable and nonquantifiable factors in problems. Let us now look at techniques for solving ill-structured problems. It is quite likely that top management in the Navy would quickly point out that decisions at this level are ill-structured and incapable of being structured so that they are not susceptible of the conventional techniques of operations research. Such a sophisticated approach is heuristic problem solving. Heuristic is a word applied to arguments and methods of demonstration which are persuasive rather than logically compelling.

A problem is well-structured to the extent that it satisfies these criteria:

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[23] J. W. Ellis and T. E. Greene, "The Contextual Study: A Structured Approach to the Study of Political and Military Aspects of Limited War," Operations Research, VIII (September-October, 1960), pp. 639-51.

a. It can be described in terms of numerical variables, scalar and vector quantities.

b. The objectives are specified in terms of a well-defined objective function (minimax theory).

c. There exist algorithms that permit the solution to be found and stated in actual numerical terms (maximization procedures in calculus, linear-programming algorithms like the simplex methods and Monte Carlo techniques).

In other words, well-structured problems can be formulated explicitly and quantitatively and are then solved by known and feasible computational techniques.[24]

Problems are ill-structured when they are not well-structured. In some cases, for example, the essential variables are not numerical at all, but symbolic or verbal. An officer who is drafting a logistic policy is searching for words, not numbers. Secondly, there are many important situations in planning where the objective function--the goal--is vague and nonquantitative. In Chapter II, it was observed that there was a translation of tasks into action because the Projected Program Objectives document states its programs in general terms.[25] How do we evaluate the quality of the Navy training system or the effectiveness of an antisubmarine warfare

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[24] Cf., Herbert A. Simon and Allen Newell, "Heuristic Problem Solving: The Next Advance in Operations Research," Operations Research, VI (January-February, 1958), pp. 4-5.

[25] Supra, pp. 29, 32.

task group? Thirdly, there are many practical problems for which computational algorithms are not available. For example, is weapons system A more efficient under a variety of situations than weapons system B?

Dr. Simon and Dr. Newell in one of their earliest articles on heuristic problem solving made these predictions:

> Operations research has made large contributions to those management decisions that can be reduced to systematic computational routines. To date, comparable progress has not been made in applying scientific techniques to the judgmental decisions that cannot be so reduced. Research of the past three years into the nature of complex information process in particular, is about to change this state of affairs radically. We are now poised for a great advance that will bring the digital computer and the tools of mathematics and the behavioral sciences to bear on the very core of managerial activity on the exercise of judgment and intuition; on the processes of making complex decisions.[26]

As we defined decision-making in Chapter III, it involves much more than the final choice among possible courses of action.[27] It relates to detecting the occasions for decisions and directing the organization's attention to them. Secondly, it involves developing possible problem solutions--range of alternatives--among which the final choice can be made. Naturally, when we think of decision-making we think of this final choice. Actually, much more management effort is allocated to attention-directing functions and to investigation, fact gathering, design, and the development of the range of alternatives.

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[26] Simon and Newell, p. 3.

[27] Supra, p. 41.

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We are now in the early stages of a technological revolution of the decision-making process. That revolution has two aspects, one considerably further advanced than the other. The first aspect, which is concerned largely with decisions close to the programmed end of the continuum, has been referred to earlier in this chapter as operations research or management science. The second aspect which we are examining now is the set of techniques that are now generally known as heuristic programming.

What is the significance of this second aspect? It is significant because it makes the statement, "Computers are just very speedy morons for carrying out arithmetic calculations"--a half-truth. This statement belongs to that class of half-truths that are important just because their implications are so misleading. Dr. Simon in a recent book has made four categorical statements about computers:

> 1. Computers are very general devices capable of manipulating all kinds of symbols-words as readily as numbers. . . .
> 2. Computers behave like morons only because we are just beginning to learn how to communicate with them in something better than moronic language. . . .
> 3. Computers do only what you program them to do in exactly the same sense that humans do only what their genes and their cumulative experiences program them to do. . . .
> 4. It has now been demonstrated, by doing it, that computers can be programmed to solve relatively ill-structured problems by using methods very similar to those used by humans in the same problem-solving situations: that is, by highly selective trial-and-error search using all sorts of rules of thumb to guide the selection; by abstracting from the given problem and solving first the abstracted problem; by using analogy; by reasoning in terms of means and ends, goals and subgoals; by adjusting aspirations to the attainable. There is no longer reason to

> regard phenomena like 'judgment' and 'insight' as either unanalyzable or unanalyzed, for, in some forms at least, these phenomena have been simulated--computers have exercised judgment and exhibited insight.[28]

We cannot pause here to develop these thoughts, but in order to present briefly some insight to these statements, John W. Carr, III, former President of the Association for Computing Machinery and a member of the University of Michigan, Department of Mathematics, wrote in 1958:

> Digital computer users have learned, during the past ten years, that oddly enough, the main use for these new information machines may not be as computers at all but rather as 'symbol manipulators.' As a symbol manipulator, evaluating and interpreting symbols from its own environment, the digital computer may be able to perform its most spectacular jobs.[29]

These ordered and meaningful sequences of symbols are what human beings call languages. Cobal, Software, Fortran, and Algol are so-called compiling techniques that instruct computers in general language very similar to the ordinary language of mathematics. From this point we proceed to chess playing where the computer may lose a few games but by evaluating its own mistakes, its game improves.[30] In addition, with

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[28]Herbert A. Simon, "The Corporation: Will It Be Managed by Machines?" Management and Corporations 1985, ed. Melvin Anshen and G. L. Bach (New York: McGraw-Hill Book Company, Inc., 1960), pp. 44-46.

[29]John W. Carr, III, "Computer Programmers Must Turn Theory into Reality," The Office (January, 1958), pp. 109-110.

[30]A. Newell, J. C. Shaw, and H. A. Simon, "Chess-playing Programs and the Problem of Complexity," IBM Research and Development Journal, II (October, 1958), pp. 320-35.

these compilers, we can now program a computer to evaluate a formula by writing down little more than the formula itself and the instruction to act. As one step in the study of intelligent behavior in machines, researchers have considered the particular case of a machine that can prove theorems in elementary Euclidean plane geometry. The device uses no advanced decision algorithm, but relies rather on rudimentary mathematics and ingenuity in the manner of a clever high-school student.[31]

Lest the reader believe that these ideas are "gimmicks" (the talking computer, the chess-playing machine), let us note that considerable work is being done on a general problem solver. Although it is not as general as its name suggests, it is entirely free from reference to any particular subject matter and is, in fact, a quite flexible scheme for reasoning about any subject in terms of goals and subgoals. The general problem solver is a program for a digital computer. It is part of an investigation into the extremely complex processes that are involved in intelligent adaptive and creative behavior. The principal means of investigation is synthesis: programming large digital computers to exhibit intelligent behavior, studying the structure of these computer programs, and examining problem-solving and other adaptive behavior that the programs

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[31] H. L. Gelernter and N. Rochester, "Intelligent Behavior in Problem-Solving Machines," IBM Journal of Research and Development, II (October, 1958), pp. 336-45.

produce.[32]

Let us be clear on one point. Heuristic programs do not merely substitute machine brute force for human cunning. Increasingly, they imitate--and in some cases improve upon--human cunning. Some people would claim that chess-playing, for example, is more structural and programmed than the problems of everyday life. Perhaps it is, although the point could be debated. However, it is sufficiently complex, sufficiently rich in alternatives, sufficiently irregular in structure that it poses the same kinds of difficulties and requirements to the computer that are presented (perhaps, to a higher degree) by ill-structured problems in general. In Dr. Simon's own words:

> Hence, the fact that chess programs, theorem-proving programs, music-composing programs, and a factory-scheduling program now exist indicates that the conceptual mountains that barred us from understanding how the human mind grapples with every day affairs have been crossed. No major new ideas will have to be discovered to enable us to extend these early results to the whole of human thinking, problem-solving, decision-making activity. We have every reason to believe that within a very short time--perhaps ten years or less--we will be technically able to produce computers that can grapple with and solve at least the range of problems that humans are able to grapple with and solve.[33]

Summary

In this chapter we have seen some of the tools and

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[32]A. Newell, J. C. Shaw, and H. A. Simon, "A General Problem-Solving Program for a Computer," Computers and Automation, VIII (July, 1959), pp. 10-16.

[33]Herbert A. Simon, "Management by Machine, How Much and How Soon?" The Management Review (November, 1960), p. 74.

techniques available to aid the planner. We have examined in part the continuum from highly programmed decisions in operational planning to the unprogrammed decisions more generally associated with once-for-all decisions of the long-range planner. Between these two extremes lie decisions with every possible mixture of programmed and non-programmed, well-structured and ill-structured, routine and non-routine elements. With this range of decisions go the tools and techniques of tried and true methods of operations research, to contextual studies in nonquantifiable factors, to heuristic problem solving. The planner must, however, tell the management scientist and researcher what he needs to do his job most effectively. But first of all the manager-planner must create a conceptual model of the whole.

CHAPTER V

A NEW MANAGEMENT-PLANNING SCIENCE

With the progress in the provinces of management science and heuristic problem solving the weaknesses in the Navy planning System may be reduced and OPNAV may be reshaped to fit the nation's defense structure. It would be useless to modify the present system because it adheres too closely to the strict disciplines of the principles of management. The present organization chart stifles the initiative and the thinking of management because of its complexity. The staff and line relationships must not be so restrictive that it becomes necessary to fit the staff specialist in without antagonizing the line.[1] Urwick's arguments would suppress the vision of the whole and place too many limitations on the managers and planners who already have a difficult task.

At this time when Mr. McNamara is strengthening civilian control and moving to centralize authority,[2] the Navy must demonstrate that it too has the best interest of the entire military establishment in its managerial concepts. The

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[1]Lyndall F. Urwick, "Fitting in the Specialist Without Antagonizing the Line," Readings in Management, ed. Harold Koontz and Cyril O'Donnell (New York: McGraw-Hill Book Company, Inc., 1959), pp. 132-39.

[2]The Wall Street Journal (Eastern Edition), March 20, 1961, p. 1.

Air Force is already beginning a major change in its organization for managing development, basic research, and general procurement. The avowed aim of the revamping is to centralize direction of major programs and give closer attention to military space projects. The revisions seek to effect more efficient management and swifter decisions by consolidating all work on development and procurement of planes and missiles in a new command to be called the Air Force Systems Command.[3]

The Objective

In this chapter is outlined concepts developed so that they operate to attain the objectives of a centralized managerial concept. Therefore, let us list those objectives so that the factors which bear may support the goals.

1. The planning function in OPNAV should support the strategic planning of the Joint Chiefs of Staff, the administration of the Secretary of Defense, the operational commitments of the various unified and specified commands, and the goals of the Navy Department.

2. It must operate within the organization and management of the Secretary of Defense and be closely integrated with the objectives of the other services.

3. It must be sensitive to the external pressures of the time, such as the economic, political, social, and psychological factors. In this regard it should be flexible enough to adjust to changes quickly and orderly.

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[3]The Wall Street Journal (Eastern Edition), March 22, 1961, p. 6.

4. The planning function must incorporate the vision of the whole Navy so that it aids the Chief of Naval Operations in his decision-making process. His decisions must be ones which are the best for the entire Navy and not parochial or self-centered. Sub-optimization should be avoided wherever possible.

5. The planning process must be compatible with the execution of the programs and at the same time compatible with the budget process in formulation and execution.

The Plan

The plan envisioned here is not a cure for all the ills of the Department of Defense or of the Navy Department. It does not resolve General Taylor's contention that our military planning is frozen to the requirements of general war nor the contention that the weaknesses on the Joint Chiefs of Staff system have left the planning of our military strategy to civilian amateurs and the budget-makers.[4] These problems, however, are under consideration today, and the Navy must be prepared to implement whatever policies result.

In Chapter III, a triumvirate of top-level planners was proposed. These officers would be supported by the variety of aids in the continuum of the decision-making programs. Their primary aim would be to interpret, describe, coordinate and balance the missions assigned to the Navy. The initial decisions

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[4]General Maxwell D. Taylor, The Uncertain Trumpet (New York: Harper & Brothers, Publishers, 1959).

by this board would be based on their best value judgment. But like the purpose of the gaming theory the final decisions would not be made until the solutions had been completely tested through the range of alternatives. Like chess playing programs a large computer could examine one million alternative possibilities, evaluating them on the basis of simple, perhaps crude criteria, until the best selection appears. Clearly, the human mind could not move in this manner.

But what will the program use for chessmen? By means of model simulation the researcher could undoubtedly conceive a system or model to achieve the objective. Since Mr. D. L. Jackson has spent a year and a half constructing such a model to suit the budget process, and since there is other evidence to support a product mission concept,[5] let us for now adopt the weapon system (as Mr. Jackson did) as the device which may be used to accomplish this evaluation. This action will ensure compatibility with the budget process (Objective 5) and define an aiming point for planning and controlling functions of top management.

Figure 7 shows the decision pattern which starts with developing the long-range concepts. This group would be responsible for gathering all facts which bear on the future planning of the Navy. They would prepare the long range charts, graphs, and other displays which require the integration of the

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[5]Jim Rosenzweig, "The Weapon Systems Management Concept and Electronic Data Processing," Management Science, VI (January, 1960), pp. 149-163.

DECISION PATTERN

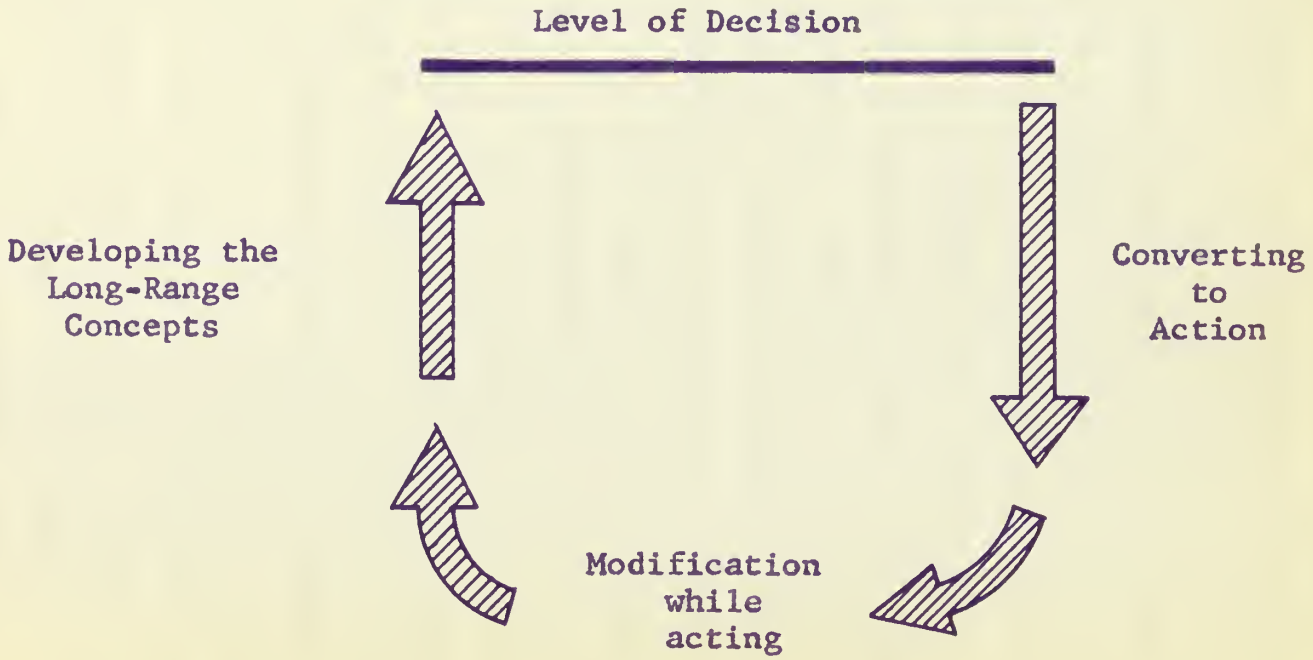

Figure 7

weapons systems with the missions. They would develop their data based on the same economic factors and sub-groupings as the control functions.[6] The range of alternatives would then be presented to the triumvirate at the (top) level of decision for initial action. Several alternatives would be selected for further testing. These alternatives would be studied through the aiming and planning cycle indicated in the left-hand position of Figure 8. This step would be to refine the decision-making process and to define problem areas caused by design, production, delivery, and utilization. The final step would be the identification of areas of duplication and conflict with current planning. Obviously, these steps would require the accumulation of a tremendous amount of data and the continuous development of techniques to express ever-changing concepts. But it would permit the alternatives to be checked through the entire management cycle before implementation.

In order to get the go-ahead from top management for an overall re-evaluation and redesign of the current system caused by breakthroughs in technology or shifting emphasis in missions, current and mid-range planning may be revamped. But these changes would be fully analyzed before top management decisions would evaluate these changes. For the long-range systems analysis to work it must be properly established at this high level to facilitate the considerable amount of revamping that may be needed. Only in this way will the vast potential of the

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[6] Infra, pp. 88-92.

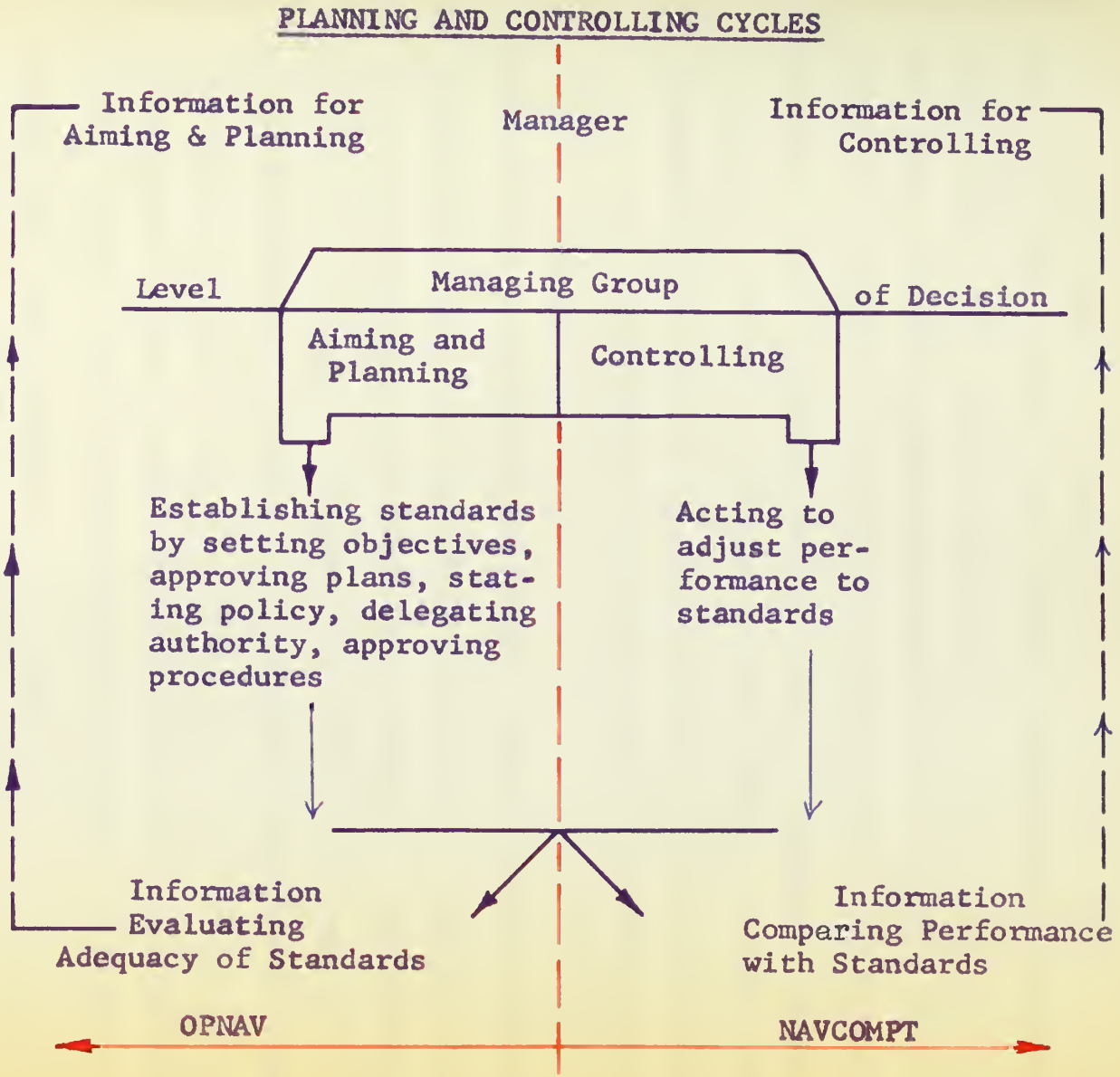
PLANNING AND CONTROLLING CYCLES
Information for Aiming & Planning
Manager
Information for Controlling
Level
Managing Group
of Decision
Aiming and Planning
Controlling
Establishing standards by setting objectives, approving plans, stating policy, delegating authority, approving procedures
Acting to adjust performance to standards
Information Evaluating Adequacy of Standards
Information Comparing Performance with Standards
OPNAV
NAVCOMPT

Figure 8

electronic computer and the management sciences be realized.

The implementation of these long-range objectives must be under the control of these same managers in order to make the above analysis function properly. The present program sponsor and program coordinators would be eliminated so that any one weapon systems would not be sub-optimized. The managing group would issue instructions directly to the bureau managers who would not modify programs without first checking with the planning managers. The program managers in the bureaus may discover that an increased production of a weapons system or a component of the system might reduce costs, but this cost reduction may not be in the best interest of the total planning.

In converting the long-range plans to current planning, the managing group would make extensive use of the extension of PERT (Program Evaluation and Review Technique), as a system management tool. In the PERT approach, the development program is first portrayed graphically as a network of interrelated activities necessary to achieve prescribed milestones or events. The PERT system flow plan or network and the critical path in the system flow plan would be worked out. The extension of this system to costs would also be determined.[7] At the same time, manpower and training information would be developed to support the weapon system. The extension of the line of balance

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[7]D. G. Malcolm, "Extensions and Application of PERT as a System Management Tool," An address delivered at The Armed Forces Management Association, Seventh National Conference, Washington, D. C., 2 March 1961.

technique developed by the Navy Management Office for the Polaris missile training program is a good example.[8] These techniques plus others would be considered in the long-range planning, revised in the mid-range and placed in final form for the current planning for budget formulation and execution.

The centralization of the decisions at this high level ensures that the "profit center", the allocation of resources, is always compared with the total defense effort by the Navy and the other services. As observed by Socony Mobil Oil Company, this concept could not have been achieved ten years ago when the new aids to management were yet undeveloped. This reorganization combines the management responsibilities previously shared by many program sponsors into a single group.[9] The execution is less complex, however, because the "middle management" level in OPNAV has been removed. It also provides for a single point of contact for the program managers in the bureaus and for the Navy Comptroller. Finally, top management has created an atmosphere conducive to long-range planning and has built a communication model for the operation. As current programs develop the day-to-day situation is accumulated in the computers so that a "trial balance" may be frequently calculated for the status of current and future planning.

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[8] E. D. Dwyer, "Educational Program Session," An address before the Armed Forces Management Association, Seventh National Conference, Washington, D. C., 28 February 1961.

[9] Supra, p. 51.

Control Aspects

In looking at the control aspects of Navy Management, it is understood that the Navy Comptroller is a separate group from OPNAV. In other words, the right-hand portion of Figure 7 is generally a function of the Navy Comptroller. Mr. Jackson's model for control is constructed so that it will fit the functional budgeting which Mr. Hitch is expected to institute in the Department of Defense. In Figure 9, the cost of the Navy for any time period is a function of:

1. Weapons systems being operated.
2. Weapons systems being bought.
3. Indirect support and level of effort.

The phrase, "Weapons systems being operated," refers to the operation and maintenance costs of a weapon system. In principle, it is no different than the presently used appropriation "Operation and Maintenance, Navy" except that these costs are directly attributable to a specific weapons system such as the Polaris weapon. In Figure 10, the direct support would be comprised of the nuclear-powered submarines with their polaris missiles. (If aircraft or submarine tenders are involved they would be included also. No Marine Corps divisions would be considered). The building blocks associated with the operational costs of the submarines would be the pay and allowances of the crews, the value of supplies consumed, including ammunition and the overhaul and repair costs to maintain the boats. A further breakdown of repair costs might segregate those repairs for regularly scheduled overhauls and

FUNCTIONAL COSTING SYSTEM

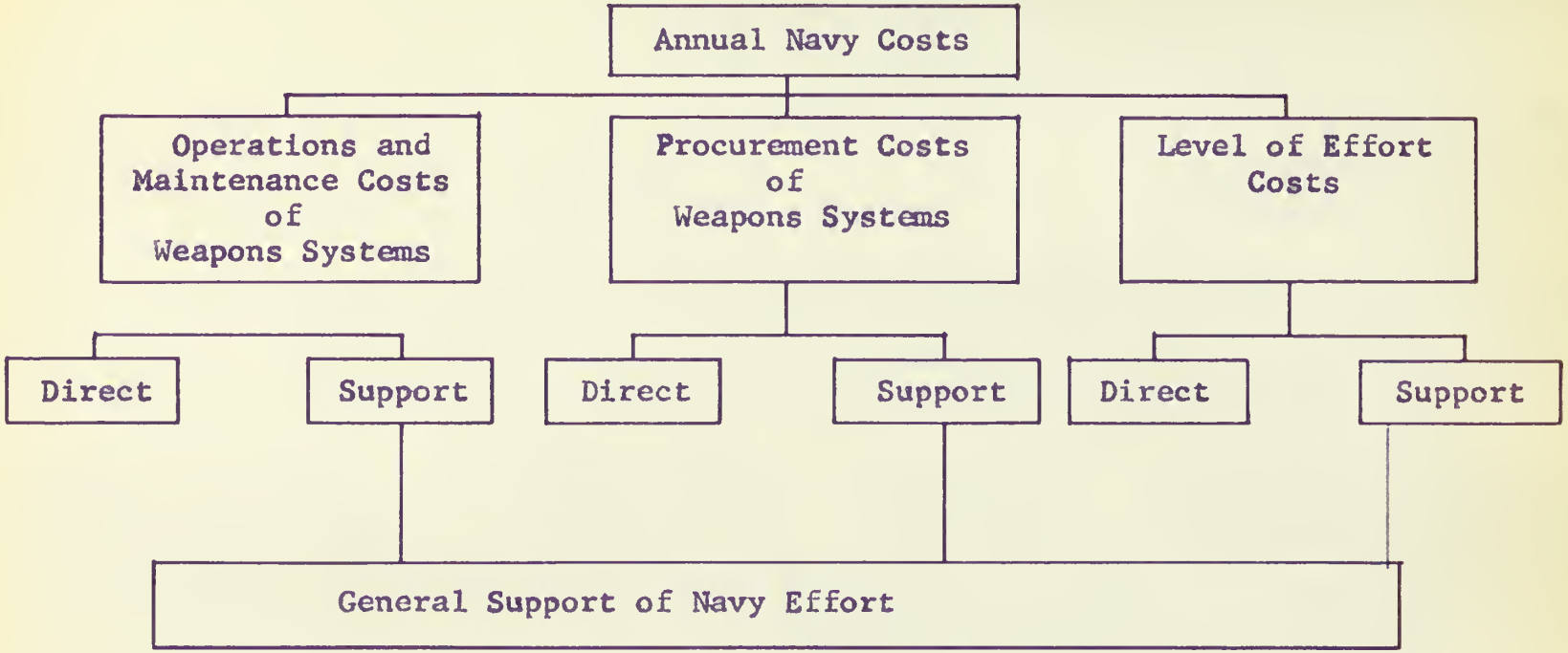
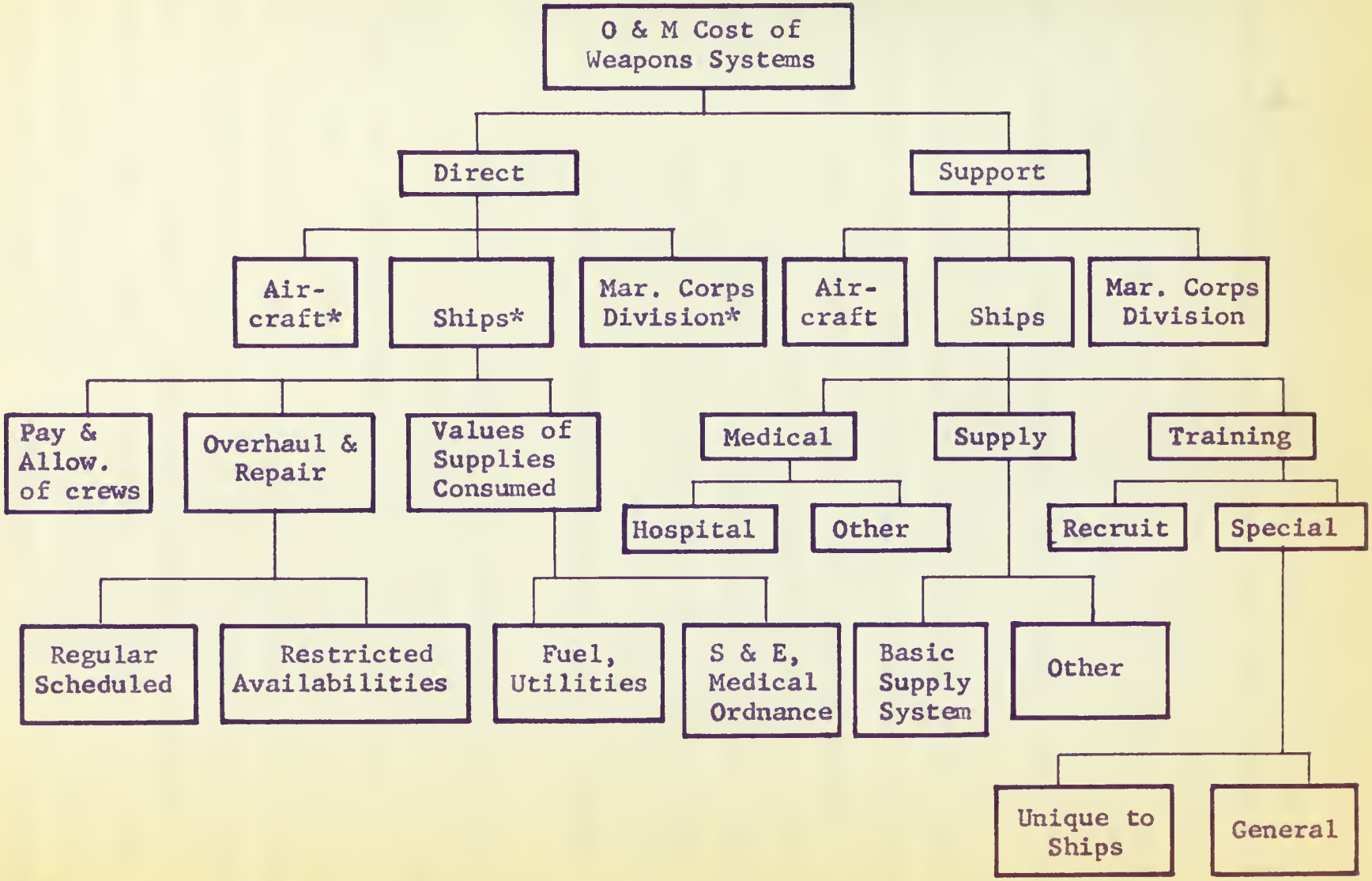


Figure 9

WEAPONS SYSTEM BEING OPERATED



*Including Missiles and Ordnance

Figure 10

for restricted (unexpected) repairs between overhauls. These costs are called direct costs (left-hand side of Figure 10); support costs are shown on the right-hand side of Figure 10. To parallel the direct costs of the submarines themselves would be the support costs for these boats such as medical costs, supply costs, and training costs. Medical costs might include the two blocks of hospitalization of personnel, and all other medical costs such as shipboard medical or base medical support. Supply costs would be compiled from the basic supply system represented by the ship's purchases of necessary stores such as food, equipment, and services. Other supply support would be items which are purchased from other than ship's funds and supplied to the submarines for installation or use. Training costs for personnel would be the basic or recruit training for officers and enlisted men and special training such as advanced schools, submarine training exercises in firing missiles, arming drills, and others.

The second accumulation of costs would be for the procurement costs of weapons systems (Figure 9). Here again these costs are divided into direct and support costs. In the procurement of all ships, aircraft, and weapons systems there are three phases: the first is basic research and development in bringing the system from conception to prototype; second is the test and evaluation when the prototype is examined to determine that it performs according to expectation; finally, the weapons system is placed in production. These costs are so identified in Figure 11. In addition, electronic equipment such

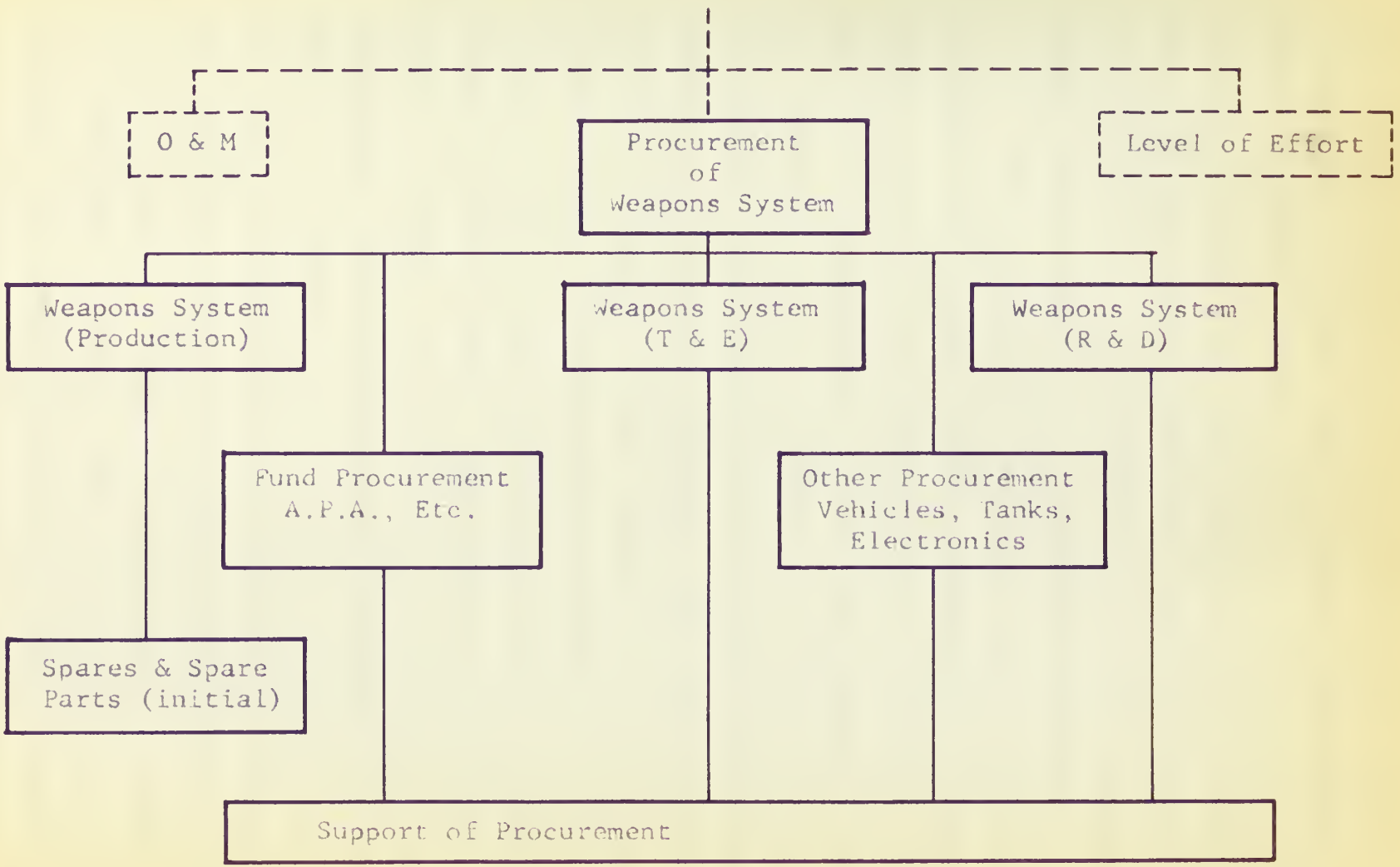

WEAPONS SYSTEM BEING BOUGHT
O & M
Procurement of Weapons System
Level of Effort
Weapons System (Production)
Weapons System (T & E)
Weapons System (R & D)
Fund Procurement A.P.A., Etc.
Other Procurement Vehicles, Tanks, Electronics
Spares & Spare Parts (initial)
Support of Procurement

Figure 11

as navigational aids might be available in stock from procurement funds such as the Navy Stock Account; while torpedoes tubes or sonar equipment might be available from special ordnance fund accounts. These later two categories would be supported from the broad base supply support but would be identified with and accounted for in a particular weapons system procurement. The supply support could be on a revolving fund basis in this case.

Finally, the third category would be the accumulation of costs which are not readily attributable to either of the first two costs because they cannot be identified with one particular weapons system (Figure 12). In fact, these costs may support one or more systems or even all of the systems. To pro-rate these costs among the weapons systems would not be feasible or equitable; therefore, they would be controlled collectively much as factory overhead is managed in an extremely large industry. This category is entitled, "Level of Effort," because it will satisfy the objective set by top management in regard to fleet support. For example, if it is felt that a Polaris submarine should be able to load stores, missiles, ammunition, affect repairs, receive personnel any time day or night at all current Naval bases in the world, it is obvious that military construction project costs and the administrative and operational costs at all shore installations would be extremely high to provide this high level of service. If this level of effort is needed only at selected ports, the costs are reduced. In a similar manner, the status of reserve forces would be a determining factor for pay and allowances of reserve

INDIRECT SUPPORT AND LEVEL OF EFFORT

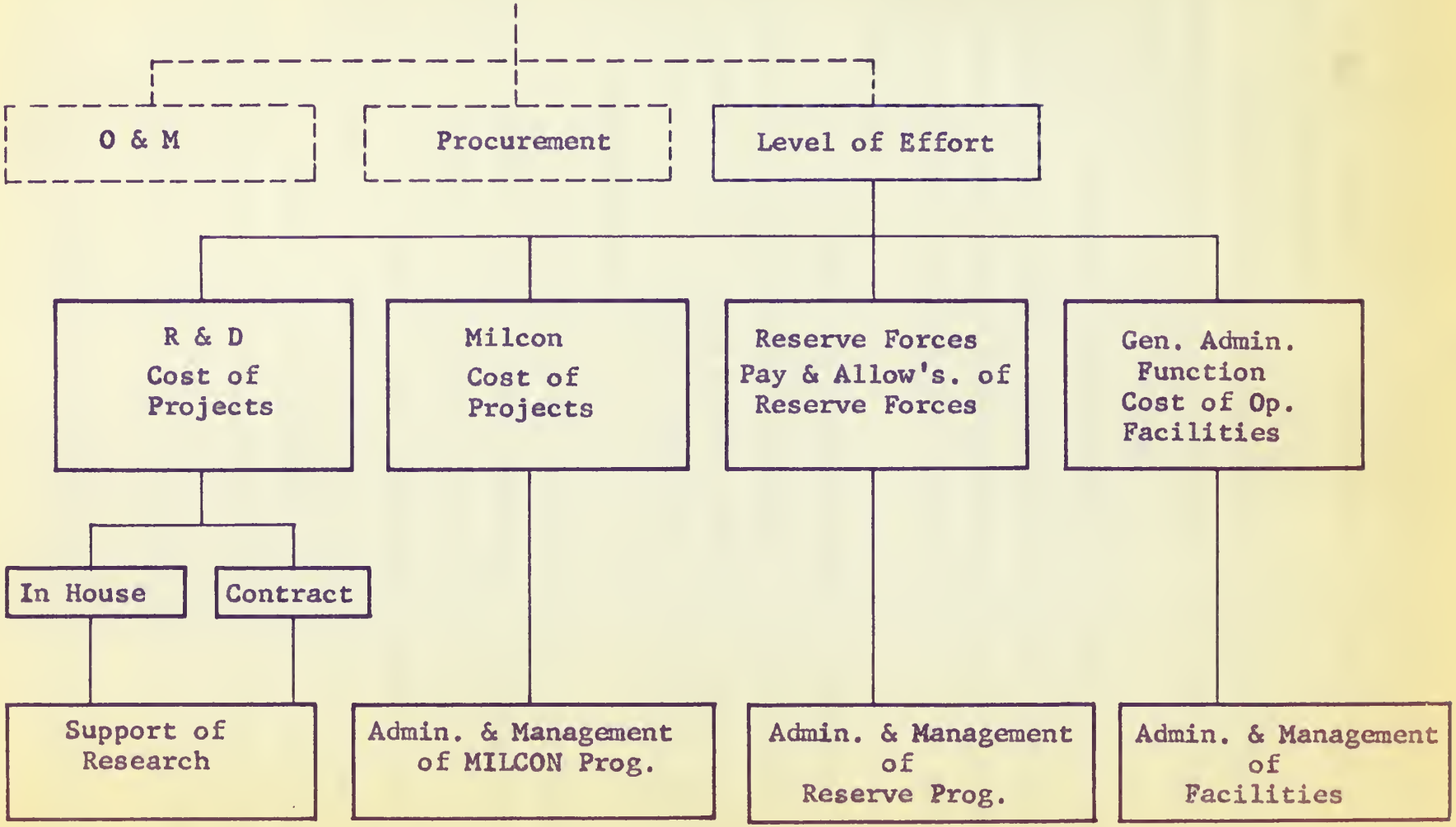


Figure 12

forces, and the research and development costs associated with this broad support effort would be calculated based on the urgency of the project.

From a study of these figures and the principles of accumulating cost, it may be seen that this model aids decision-making in this fashion:

1. If various alternatives of present and future force structures, and policies on research, construction, and reserves, are given, then total cost budgets can be quickly estimated by electronic data processing for rapid comparison of these alternatives.

2. If various alternative program adjustments to current or projected budgets are given for the entire Navy or for segments such as task forces, financial impact of these adjustments can be quickly estimated by electronic means to aid in decision-making.

3. If the composition of task forces to perform a specific function such as anti-submarine, hunter-killer operation is given, the cost of that function can be quickly accumulated by electronic data processing machines for preliminary budgeting or for cost-effectiveness comparison.[10]

Mr. Jackson has constructed his model to be compatible with the appropriation structure and the functional budgeting expected to be established in the Department of Defense.

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[10] D. L. Jackson, An address before the Navy Graduate Comptrollership Course, The George Washington University, March 3, 1961.

The OPNAV managing group would use this model to analyze and relate their proposed costs so that their decisions are realistic and attainable within the resources. In addition, they would direct their questions, range of alternatives, their solutions, and their decisions toward the "givens" listed above.

It is again observed that some portions of this model and any models related to it will be well-structured and some ill-structured. But the tools and techniques described in Chapter IV are available to aid the managing group.

Summary

It is not possible in this paper to enumerate the many facets of the management-planning science envisioned. The main thesis, however, has generally been aimed at a new approach, a new emphasis on planning. This idea embraces an approach to planning which is quite different from the operational type of planning which is going on today. The concentration of responsibility and authority in OPNAV could not be achieved without the management aids developed in recent years nor could these ideas thrive except in a management atmosphere such as the one being created by Mr. McNamara.

The central theme is the necessity for management to adapt to major changes in their internal and external environments in the next twenty-five years. Across-the-board knowledge in every field of study reveals a dynamic evolution in the years ahead. A new technology of decision-making is beginning to raise critical questions about adaptation in the organization

structure and to the functions of managers. It poses equally critical questions about the effect on human beings of a new order of man-machine relationship. How creatively management in the Navy can respond to these demands will determine the character and even perhaps the existence of our Navy.[11]

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[11] Cf., Melvin Anshen, "Management and Change," Management and Corporations 1985, ed., Melvin Anshen and G. L. Bach (New York: McGraw-Hill Book Company, 1960), pp. 199-238.

CHAPTER VI

SUMMARY

This thesis began by assessing recent events which are affecting Navy management. Legislative and administrative pressures are forcing the Chief of Naval Operations to make a careful reappraisal of the relationship of his office to the military establishment as a whole and to the Navy Department in particular. Is his office today primarily concerned with strategic, operational, logistical, or program planning? There is sufficient evidence that strategic planning and operational planning are more closely associated with the Secretary of Defense and the Joint Chiefs of Staff than they are with the Chief of Naval Operations. This change in administration warrants a new definition of the primary objectives of the Office of the Chief of Naval Operations.

A second factor which relates to Navy management is the economic impact of defense spending. Not only must this spending in peacetime be kept within reason, but also it must be more nearly correlated with efficiency. In 1947, Mr. Mooney wrote:

> The fact is that an army or navy, because of the conditions under which it operates, must be supremely efficient. When we consider that the group must 'carry on' even when it is literally shot to pieces we realize that here is the most extreme test the mind can conceive of a true

> coordination of effort. It likewise explains why the efficiency of an army or navy demands an intensity of discipline beyond anything demanded in other spheres. The general fact remains, however, that the efficiency of any form of organization depends on the measure of its discipline, and this truth finds in military organization its outstanding illustration. The stupendous effort and performance of World War II demonstrated the efficiency of military organization and justifies the search for anything in its spirit or its structure that can be applied in other spheres.[1]

The truth of Mr. Mooney's statement is self-evident still. But, in addition, there is no doubt that a country can be lost through subversion, political coup d'etat, psychological defeatism, or economic chaos. In order to ensure that the economic condition of our government remains on an even keel the efficiency of military organization takes on a larger connotation than a purely operational meaning.

As the technological changes develop rapidly, and as the weapons of war increase in complexity, the cost of warfare grows to gigantic proportions. In fact, this cost is so large that it presents a threat to our national security as great as an absence of weapons does. Therefore, it becomes necessary to develop measures or standards to balance efficiency and economy. These standards will, if the desires of Mr. McNamara and Mr. Hitch prevail, equate the cost of weapons systems to the total resources available. In order to maintain a strong Navy, top management must be ready to prove not only the operational capabilities of its weapons, but also the

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[1]James D. Mooney, The Principles of Organization (New York: Harper & Brothers Publishers, 1947), p. 125.

comparative economic advantages of these systems. No longer can the Navy hide behind the facade of multiple functions of its weapons systems and assert that these varied functions make economic evaluation impractical.

The contention, therefore, is that the management function in OPNAV is gaining importance. The Army Chief of Staff has long since divorced himself from operational duties and devoted his attentions to logistic planning and advisory functions. So must the Chief of Naval Operations! Since the logistic and program planning are becoming dominant, a clearer and larger role must be given to these functions. No longer should the concepts of operational planning be adapted to program planning, but rather a new planning method must be devised to suit a different concept of management.

The second focus of this thesis is an extension of the relationship between efficiency and economy. If resources are limited in peacetime--as they are--then it behooves the Navy to develop a planning system which is farsighted in setting long-range goals and yet near-sighted enough to handle current objectives. Since these ideas may at times be at odds one with the other, it is necessary to build into planning some calculated risks. Every effort must be made to maximize the resources and yet minimize the risk. This idea correctly suggests that the economics of defense and the task of making military decisions are interlocked. Thus, the Chief of Naval Operations, as the senior naval advisor, must ensure that the management of the Navy programs at the present time and in the

future accomplishes both the military and the economic objectives.

This management must be concentrated--it cannot function properly if it is stretched over an operational framework. The development of the present program objectives are distorted in the first instance when they are translated from the war plans; and then again when they are translated into end-products. These distortions have many causes such as complexity of the Navy consumer-producer organization, day-to-day concern with execution of programs, sub-division of duties and responsibilities in OPNAV, parochial viewpoints of some officers, budget process pressures, and appropriation requirements. Only because of the professional knowledge, resourcefulness, and personal contact of the personnel is the current end-result passable.

Fortunately, at a time when the demand for a new system of managerial planning arises, and as the complexities of program planning increase, management tools and techniques are becoming available to alleviate these pressures. During the decade of the 1950's, many groups in the management science field and the behavioral science field have been studying, analyzing, defining, testing, and evaluating the decision-making process. In 1955, Mr. John McDonald wrote, "Businessmen are remarkably candid about their own inability to analyze the act of decision."[2] In 1960, Professor Simon states "Decision

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[2]John McDonald, "How Businessmen Make Decisions," Fortune (August, 1955), p. 85.

making comprises three principal phases: finding occasions for making a decision; finding possible courses of action; and choosing among courses of action."[3] With this simple beginning Dr. Simon traces the revolution now being shaped by new instruments of management, in which the decision-making process is becoming so clearly defined that electronic computers can be programmed to imitate the mechanics of human thinking. This breakthrough in the decision-making process permits a better understanding of management functions.

The continuum of available tools and techniques is broad indeed. The mathematical tools of operations research are growing each day to incorporate areas of decision-making which until recently were thought to be applicable only to the human brain. The calculated risks of the minimax theory which were formerly reserved for operational doctrine are found to be adaptable to military long-range planning as well. Such conventional, tested techniques are now being developed to embrace nonquantifiable factors such as political and economic factors. Other tools are being forged to aid decision-makers to improve their decision so that uncertainties of the future are better handled. Finally, the continuum provides a new tool of heuristic problem-solving for automated processes to aid nonrepetitive types of decisions. The electronic computer as merely a complicated machine for accumulating data and punching out cards or tape hardly demonstrates its capabilities. More

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[3]Herbert A. Simon, The New Science of Management Decision (New York: Harper & Brothers Publishers, 1960), p. 1.

significant jobs for this electronic marvel are already under consideration.[4] Heuristic problem-solving is only one promising extension of computers.

In order to develop an environment in which these tools and techniques can serve top management in the Navy, new managerial relationships must evolve. These tools are not simply information gathering machines. This is only one phase of the decision-making process. These tools are capable of arming the planners' imagination and capable of giving him a vision of the whole which has been sorely needed. For the first time, it is possible to centralize management planning and execution to optimize the resources for the good of the entire Navy. This centralization allows a closer relationship between current decisions on the one hand and future decisions on the other.

But it is known that planning and directing are only fragments of management; controlling is also a major consideration. In the Navy much of this control is exercised through the Navy Comptroller who is not a part of OPNAV. As a result, it is necessary to formulate a planning system which is compatible with the control segment. Since the Navy Comptroller has already devised a budget formulation model (which is, in turn, compatible with the appropriation structure), it is advisable to develop a comparable planning model. Since Mr. Jackson's model is flexible enough to incorporate centralization, the economic

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[4]Dr. Paul H. Anderson, "An Integrated System for Managing Programs and Operations with Computers," An address before the Navy Comptrollership Program at The George Washington University on 28 March 1961.

impact of a weapons system concept, and the latest tools of management, it is a useful point of departure for discussion.

These ideas, then, are the basis for this paper: changes in administration, the economic impact of defense spending, the increased need for better methods of program planning, a closer relationship between planning, directing, and controlling, and finally a stronger tie between planning and operations research on the one hand and man and machines on the other. Perhaps more emphasis has been placed on the pressures and problems than on a solution. Let there be no suggestion, however, that the problems are hopeless. One approach has been presented. The concepts from which this approach are derived are open to discussion and expansion. If these concepts require re-organization of OPNAV or even the Navy Department, so be it! No idea, no slogan, no organization, no individual, no creed, no principle is sacred. The needs of the Navy in the 1970's must be conceived, developed, and ready for use with one eye on the present and the other on the future.

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