



PROGRAMING SYSTEM

Dr. Harold Asher

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PROGRAMING SYSTEM

23 October 1963

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INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

Dr. Harold Asher, Deputy Assistant Secretary of Defense (Programing), Office of Assistant Secretary of Defense (Comptroller) was born in Chicago, Illinois. He attended the University of Illinois where he received the B. A. degree, and Ohio State University where he received the Ph. D. degree. He also attended Northwestern University and the University of California. He served with the U. S. Army from 1943 to 1946. Dr. Asher's first position with the U. S. Government was as an analytical statistician with the Air Force Air Materiel Command in Dayton, Ohio, from 1951 to 1952. From 1952 to 1956 Dr. Asher was employed in the cost analysis department of the RAND Corporation in Santa Monica, California. Prior to joining the General Electric Company in 1957, he was an economist in Radioplane's development planning department in Van Nuys, California. Dr. Asher was manager of economic analysis with the General Electric's Technical Military Planning Operations in Santa Barbara, California. At the same time he held that position he was employed as a guest lecturer with Harbridge House, Inc., in Los Angeles, lecturing on development of cost estimating techniques. He assumed his present position in January 1963. This is his first lecture at the Industrial College.

PROGRAMING SYSTEM

23 October 1963

GENERAL STOUGHTON: Gentlemen: We have all heard from Secretary Hitch now on the overall triumverate of plans, programs, and budgets in which we all know that each element is inseparable from the others.

We are now fortunate to have one of Mr. Hitch's capable deputies to cover a specific area, that of programing.

Dr. Harold Asher is the Deputy Assistant Secretary of Defense for Programing. It is a pleasure to welcome him to the Industrial College.

Dr. Asher.

DR. ASHER: Thank you, General Stoughton. I am sure that it is not necessary to tell you that while defense management is not as exciting or dramatic a subject as military strategy and forces, it is equally important to the overall efficiency of the defense effort. Therefore, I would like to talk to you today about some of the concepts and mechanics of the Programing System, improvements we are considering, and some of our achievements so far.

Prior to 1961, military planning and financial management were treated as independent activities: the first, falling within the province of the Joint Chiefs of Staff and the planning organizations of the military departments; and the second, within the province of the Comptroller. As you can see from chart 1, page 2, planning was done in terms of military services, forces and major weapon systems, projected over a period of several years. Budgeting was done in terms of functional categories--military personnel, operation and maintenance, procurement, et cetera--projected only one year ahead.

BUDGETING

FY 60

ARMY

- Military Personnel
- Operation & Maintenance
- Procurement
- Res., Dev., Test & Eval.
- Military Construction

NAVY

- Military Personnel
- Operation and Maintenance
- _____
- _____
- _____

AIR FORCE

- Military Personnel
- _____
- _____
- _____

MILITARY PLANNING

FY 60

ARMY

- Infantry Divisions
- _____
- Armored Regiments
- Hawk Anti-Aircraft Bns.
- _____
- Engineer Combat Bns.
- Aviation Companies

NAVY

- Attack Carriers
- Attack Submarines
- _____
- Mine Warfare Vessels
- _____
- Marine Air Wings

AIR FORCE

- Heavy Bomber Wings
- _____
- Fighter Interceptor Sqds.
- Tactical Reconnaissance Sqds.
- Troop Carrier Sqds.
- _____

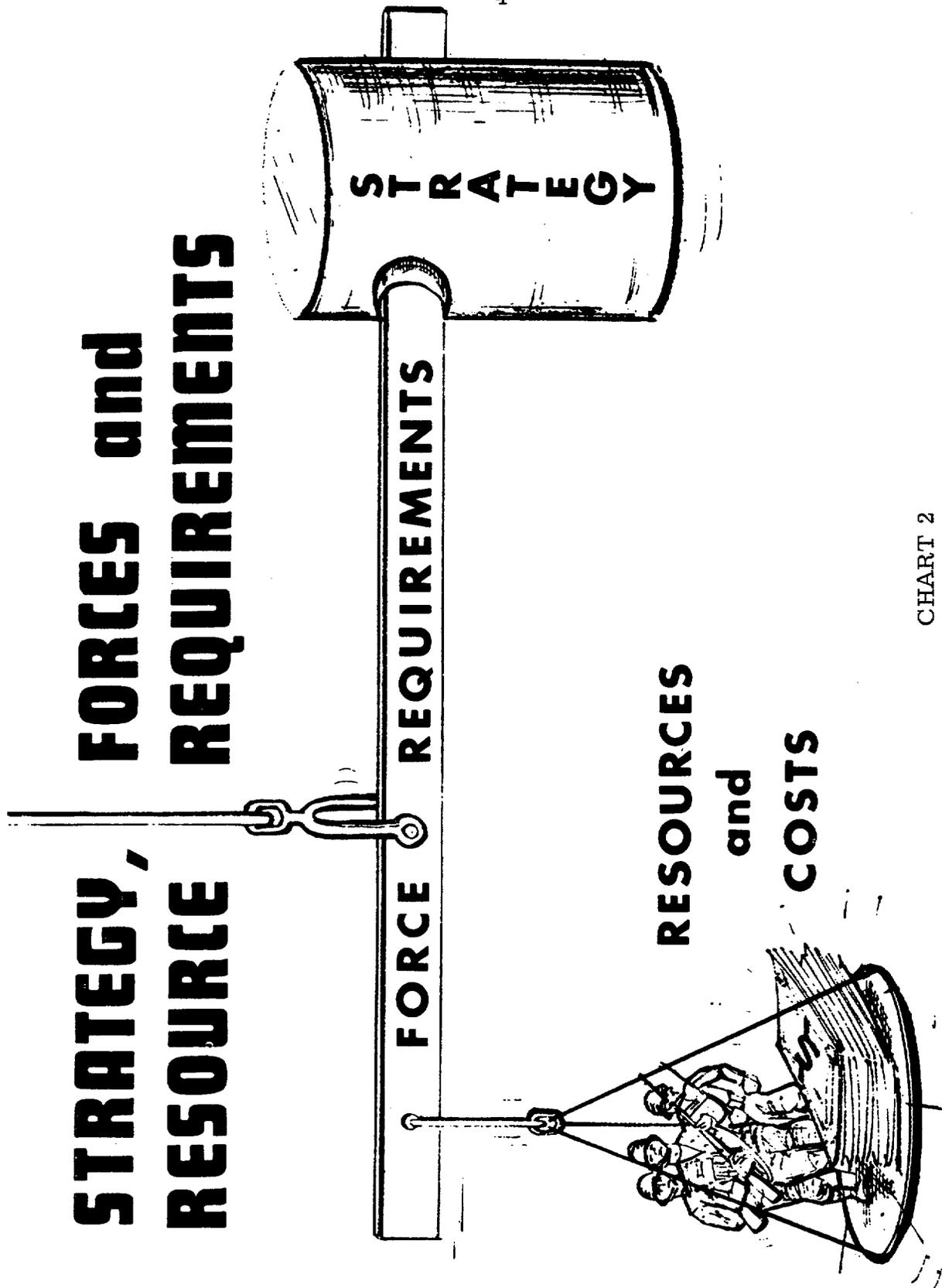
CHART 1

To bridge this gap between planning and budgeting, and to harness all the diverse activities of the Defense establishment, we have designed and installed during the last two and one-half years a unified planning-programing-budgeting system. It is not the only management system we use. We have other systems to help manage such specific areas as manpower, supply, military family housing, et cetera.

But the planning-programing-budgeting system is the only one which ties all facets of the Defense effort together, relating national security objectives to strategy, strategy to forces, forces to resources, and resources to costs--all within the same conceptual framework and all projected several years into the future, charts 2 and 3, pages 4 and 5.

The first phase of the decision-making process--military planning and requirements determination--involves the participation of all appropriate elements of the Defense Department in their respective areas of responsibility. This is the phase in which the Joint Chiefs of Staff organization and the planners in the military departments play a particularly important role. Although the system provides for specific changes in plans and requirements at any time during the year, there is a need for a comprehensive review and analysis, at least once a year, of the entire longer-range military plan and the forces required to support it. The product of this effort is the Joint Strategic Objectives Plan or (JSOP) which is prepared by the Joint Chiefs of Staff with the assistance of the planners in the military departments. The military plans and force requirements are developed on the basis of broadly stated national security policies and objectives, and intelligence assessments of our opponents' likely future capabilities. This is a dynamic process. Plans are continually being modified as old assumptions are tested, new data are integrated, new intelligence information becomes available, and alternative ways of accomplishing specific military tasks are examined and new choices made.

STRATEGY, RESOURCE FORCES and REQUIREMENTS



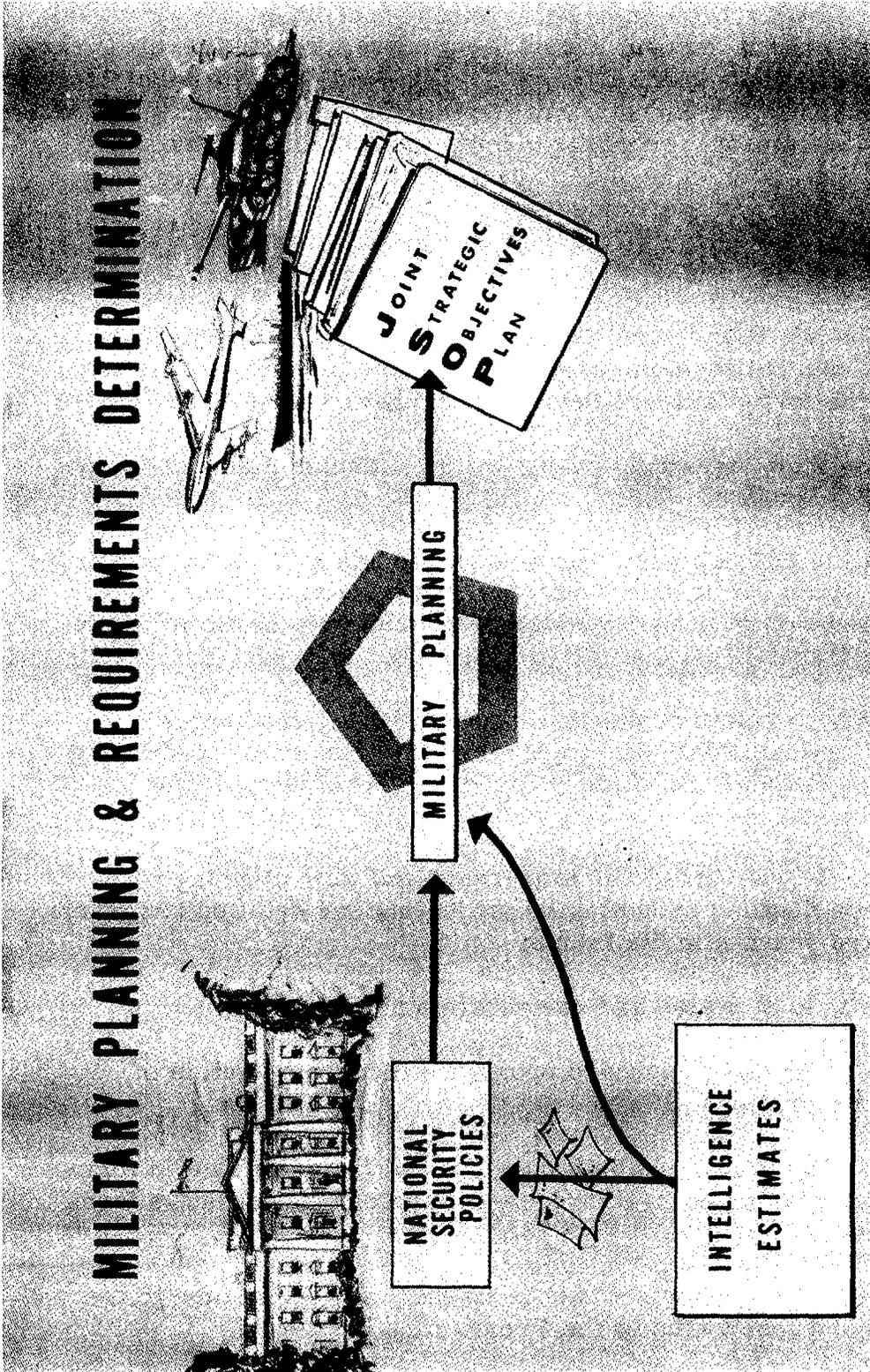


CHART 3

The force requirements are directly related to the major military missions of the Defense Department--that is, strategic retaliatory, continental defense, et cetera--and are projected several years into the future, see chart 4, page 7. The JSOP with its force tables is transmitted to the Secretary of Defense for information and to the military departments for guidance in the preparation of their proposed changes to the approved 5-year program. The Secretary of Defense makes his force decisions in terms of the major programs, during the second phase of the planning-programing-budgeting process.

As I noted, this second phase of the process is designed to bridge the gap between longer-range military planning on the one hand and the formulation of the annual budget request on the other.

During the programing phase we try to accomplish the following (chart 5, page 8):

First, to develop our programs on the basis of broad military missions which cut across traditional organizational lines, rather than on the basis of unilateral plans and priorities of the military services;

Second, to relate resource "inputs,"--i.e., manpower, materiel, and installations--together with their costs, to military "outputs"--strategic retaliatory forces, general purpose forces, and others;

Third, to coordinate our long-range military planning with short-range detailed budgeting by projecting our detailed programs at least five years into the future;

Fourth, to appraise and reevaluate our program;

Fifth, to control approved programs through a system of progress reporting;

And sixth, to provide both physical and financial data in forms suitable for making cost/effectiveness studies of alternative force structures.

So much for concepts and objectives. Now let us turn to the structure and mechanics of the Programing System.

MILITARY PLANNING



STRATEGIC RETALIATORY FORCES

- Bomber Forces
- Land Based Missile Forces
- Sea Based Missile Forces

CONTINENTAL AIR AND MISSILE DEFENSE FORCES

- Fighter Aircraft Forces
- Surface-To-Air Missile Forces
- Surveillance And Warning Systems

GENERAL PURPOSE FORCES

- Army Combat Forces
- Navy Carrier Strike Forces
- Air Force Tactical Aircraft Forces

CHART 4

OBJECTIVES OF PROGRAMMING PROCESS

- **PLAN PROGRAMS AROUND MISSIONS RATHER THAN SERVICES**
- **RELATE RESOURCES TO MILITARY OUTPUT**
- **COORDINATE LONG-RANGE PLANNING WITH BUDGETING**
- **APPRAISE PROGRAMS ON CONTINUOUS BASIS**
- **CONTROL APPROVED PROGRAMS THROUGH TIMELY PROGRESS REPORTS**
- **PROVIDE CAPABILITY FOR MAKING COST EFFECTIVENESS STUDIES OR ALTERNATIVE FORCE STRUCTURES**

The entire Defense effort is organized into the nine "major military programs" shown on chart 6, page 10. These programs are broad aggregations of smaller elements that either complement each other, or are close substitutes, and which, therefore, must logically be considered together in relation to the common mission or a given set of purposes they are designed to serve. The major military programs themselves are divided into further broad sub-groupings.

As an example, let us look at Program III, the General Purpose Forces. Included in this program are most of the Army and Navy combat forces, all of the Marine Corps combat forces, and the tactical units of the Air Force.

Shown on chart 7, page 11, are the Army General Purpose Forces. In contrast to the other services, the Army forces are grouped geographically; Europe, Pacific, Alaska, Caribbean, and the Continental United States. These are the first broad subgroupings. The next grouping is by mission--Combatant Forces and Command and Support Forces. Below that are the program elements which are the basic building blocks and the decision-making level of the programming process. A "program element" is defined as an integrated force or activity--a combination of men, equipment and facilities whose effectiveness can be directly related to national security objectives. For example, the NIKE-HERCULES force--together with all of the supplies, bases, weapons, and manpower needed to make it effective militarily--is such a program element. We have displayed here in detail the program elements for the forces in Europe. The forces in the other areas are similarly organized.

The Combatant Forces include the divisions, regiments, brigades, missile commands, et cetera and the separate battalions.

Under the battalion subheading are the NIKE-HERCULES, HAWK, MAULER, and so on. The Command and Support Forces are separately grouped in two program elements, Logistical and Support Forces, and Administrative and Command Forces.

The Navy General Purpose Forces are grouped, basically, by mission--the Attack Carrier Strike Forces, Surveillance and Ocean Control Forces, Mine Warfare Forces, et cetera, see chart 8, page 12.

Under the Attack Carrier Strike Forces are the attack carriers, further subdivided by type, and the attack carrier air groups.

PROGRAMS

- I STRATEGIC RETALIATORY FORCES**
- II CONTINENTAL AIR AND MISSILE DEFENSE FORCES**
- III GENERAL PURPOSE FORCES**
- IV AIRLIFT AND SEALIFT**
- V RESERVE AND GUARD FORCES**
- VI RESEARCH AND DEVELOPMENT**
- VII GENERAL SUPPORT**
- VIII CIVIL DEFENSE**
- IX MILITARY ASSISTANCE**

CHART 6

GENERAL PURPOSE FORCES - ARMY

EUROPE

	<u>COMBATANT FORCES</u>	<u>COMMAND AND SUPPORT FORCES</u>
<u>DIVISIONS</u>	<u>BATTALIONS</u>	Logistical and Support Forces
Armored	NIKE HERCULES	Admin and Command Forces
Mechanized	HAWK	
	MAULER	
<u>BRIGADES</u>	HONEST JOHN	
REGIMENTS (ARMED. CAV.)	REDSTONE	
MISSILE COMMANDS	CORPORAL	
SPECIAL FORCES	SARGEANT	
AVIATION COS.	LACROSSE	
OTHER COMBAT FORCES	PERSHING	
COMBAT SUPPORT UNITS	Other Artillery	

Similar as above

CONUS

CARIBBEAN

ALASKA

PACIFIC

CHART 7

GENERAL PURPOSE FORCES - NAVY

ATTACK CARRIER STRIKE FORCES

- Attack Carriers (By Type)
- Attack Carrier Air Groups

SURV. & OCEAN CONTROL FORCES

- ASW Aircraft Carriers
- Carrier ASW Air Groups
- Submarines
- Escort Ships
- Small Patrol Ships
- Patrol Aircraft (Sqdns)

MINE WARFARE FORCES

AMPHIBIOUS ASSAULT FORCES

MULTI-PURPOSE COMBAT FORCES

- Cruisers
- Frigates
- Destroyers

SPECIAL COMBAT SUPPORT FORCES

LOGISTIC & OPER. SUPPORT FORCES

COMD. COMMUN. & COMD. SUPPORT

MARINE CORPS DIV. WING TEAMS

- Marine Divisions
- Tank Battalions
- Light Anti-Aircraft Msle. Bns.
- Honest John Bns.
- Amphib. Tractor Bns.
- Other Combat Support Forces
- Marine Air Wings
- Air Sta. & Air Facil.
- Hq. Fleet Marine Forces

RESERVE FLEET FORCES

FLEET SUPPORT BASES, STA. & ACTIV.

Under the Surveillance and Ocean Control Forces are the ASW aircraft carriers, the carrier ASW air groups, submarines, escort ships, et cetera.

Under the Multi-purpose Combat Forces are the cruisers, frigates, and destroyers not otherwise assigned.

The Marine Corps forces are grouped under the heading "Marine Corps Division Wing Teams," and include the Marine divisions, tank battalions, Marine air wings, et cetera.

The Air Force General Purpose Forces are grouped in five categories--Tactical Aircraft Forces with each type listed as a separate program element, the Interceptor Aircraft Forces (including three types of aircraft), the Surface-to-Surface missile forces (including two types of missiles), the Counterinsurgency Forces, and the Command Control, Communications and Command units, chart 9, page 14.

The General Purpose Forces constitute the largest single major program and, in many respects, the most complex. They are designed to perform a wide variety of different missions and are equipped with a very great variety of different weapons.

Skipping now to Program VI----

The Research and Development Program, includes all of the research and development projects not directly associated with program elements in the mission-oriented programs. (chart 10, page 15.) Development effort associated with systems approved for production and deployment is included as part of the program element in the appropriate mission-oriented program. Thus, the NIKE-ZEUS which has not been approved for production and deployment remains in the R. & D. program, while the cost of further development of the POLARIS missile is included in the program element "Fleet Ballistic Missile System" of the Strategic Retaliatory Forces program, since that system is already being deployed. The criterion for moving a project from the Research and Development program to a mission-oriented program, therefore, is a decision to produce and deploy the weapon system.

GENERAL PURPOSE FORCES - AIR FORCE

TACTICAL AIRCRAFT FORCES

F - 84	B - 57
F - 86	B - 66
F - 100	RF - 84
F - 101	RF - 101
F - 104	RF - 4
F - 105	RF - 111
F - 4	RB - 66
F - 111	KB - 50

INTERCEPTOR AIRCRAFT FORCES

F - 89	F - 102
F - 106	

SURFACE -TO-SURFACE MISSILE FORCES

MATADOR
MACE

COUNTERINSURGENCY FORCES

COMMAND CONTROL COMM. & SUPPORT

Air Weapon Control System
PACOM & EUCOM ELINT Centers
Other Communications
Base Operating Support
Advanced Flying Training
Hq. & Command Support

RESEARCH & DEVELOPMENT

RESEARCH

PHYSICAL SCIENCES
IN-HOUSE LABORATORY

EXPLORATORY DEVELOPMENT

COMMUNICATIONS
AIRCRAFT
SHIPS, SUBMARINES & BOATS
MISSILES
AEROSPACE PROPULSION

ADVANCED DEVELOPMENT

ANTI-TANK MISSILE
VTOL AIRCRAFT
DYNASOAR
SATELLITE COMMUNICATIONS

ENGINEERING DEVELOPMENT

TANK, MAIN BATTLE
NIKE-ZEUS
TORPEDO MK-46
ASW ROCKETS
ALL WEATHER ATTACK CRAFT
ADVANCED ICBM
SATELLITE INSPECTOR

MANAGEMENT & SUPPORT

FACILITIES AND INSTALLATIONS
SUPPORT
MISSILE RANGES
CONSTRUCTION IN SUPPORT OF
RESEARCH & DEVELOPMENT

CHART 10

As I noted earlier, one of the objectives of the programing process is to relate the military forces and activities to their costs over the 5-year period. As a further aid to management we break down the cost of each program element into three categories-- Research and Development, Initial Investment and Annual Operating-- each of which has its own particular significance in the decision-making process.

The first category, Research and Development, shown on chart 11, page 17, represents the cost of bringing a new weapon or capability to the point where it is ready for operational use. Since the cost of development alone may run into very large sums, making a commitment to develop is in itself a major management decision.

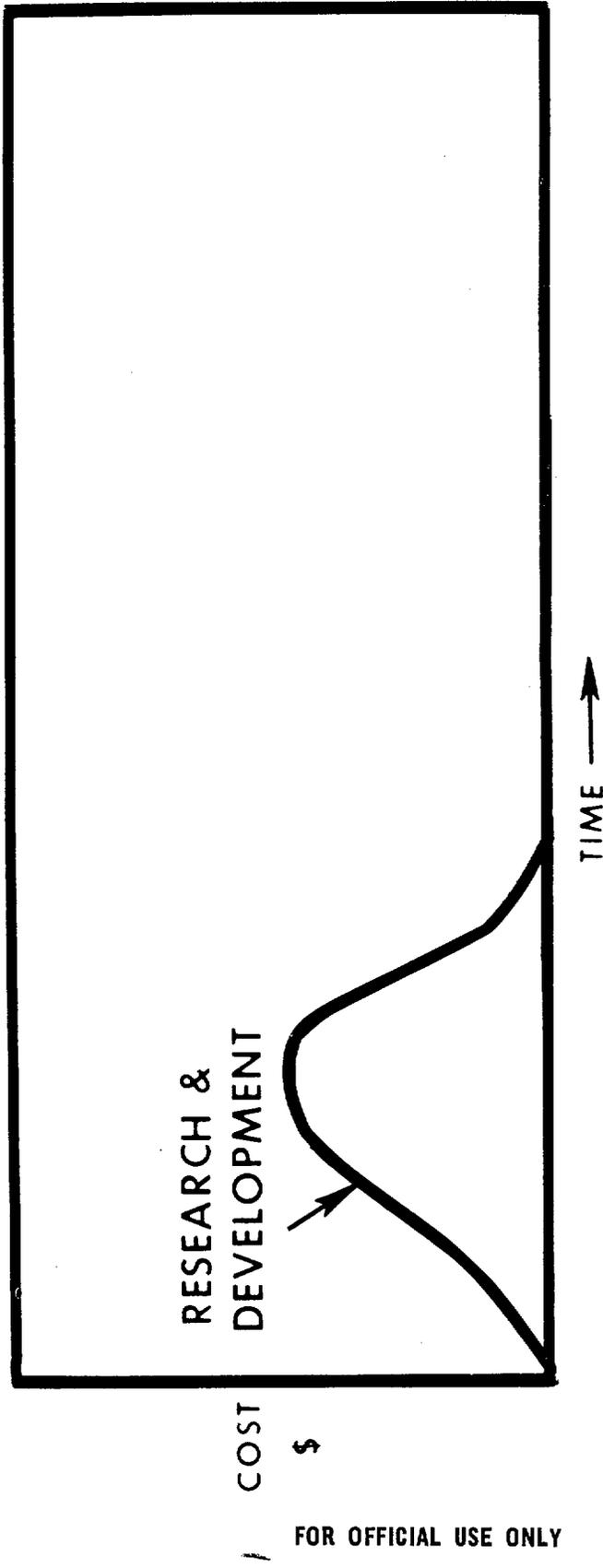
The Investment category (chart 12, page 18) represents the costs beyond the development phase required to introduce a new capability into operational use. These decisions many times involve outlays of 4, 5, and even more billions of dollars. Our investment in the B-52 force over the years is estimated at well over \$7 billion, excluding the cost of tankers, air-to-surface missiles, et cetera.

The Operating costs are the annual recurring costs required to man, operate, and maintain the capability (chart 13, page 19). Quite often the cost of operating a system over its expected life is more important than investment costs. For example, it costs us as much to operate and maintain an infantry division for one year as it does to equip it in the first place. Thus, operating costs can be crucial to the initial management decision to produce and deploy one weapon system as compared with another.

Therefore, wherever possible we try to estimate the total cost, including R. & D., investment and operating costs through what we call the "first line life" of the weapon system before any decision is made to proceed with a major development.

As I noted earlier, changes in the program are made as necessary, at any time during the year. However, the majority of the important changes have been concentrated in the 3-month period, July, August, and September, following the completion of the annual JSOP by the Joint Chiefs of Staff in April. This was done so that the Secretary could substantially complete his program review, and the military departments could be furnished an approved program for the next five fiscal years upon which to base their budget estimates for the coming fiscal year. I will talk more about this schedule in a little while.

COST CATEGORIES



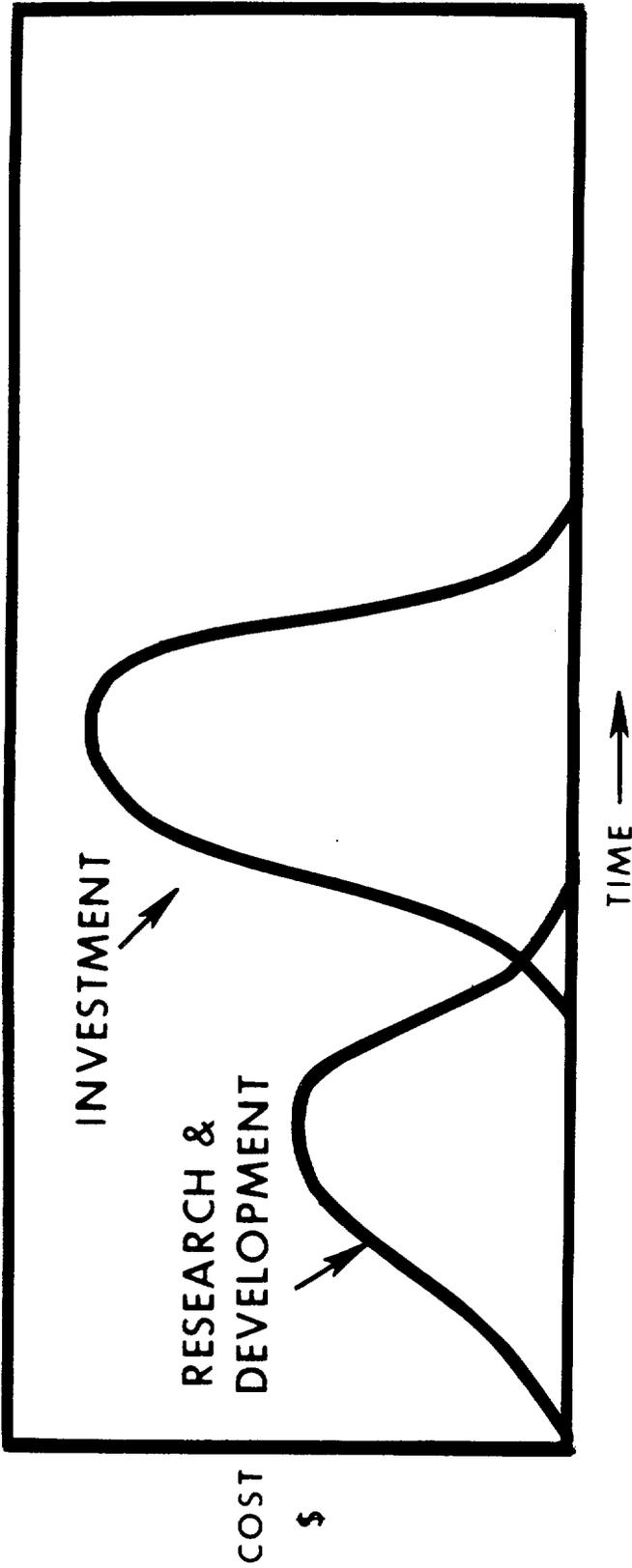
COST
\$

TIME →

RESEARCH & DEVELOPMENT OF A NEW CAPABILITY TO THE
DEVELOPMENT POINT OF INTRODUCTION INTO OPERATIONAL USE

CHART 11

COST CATEGORIES

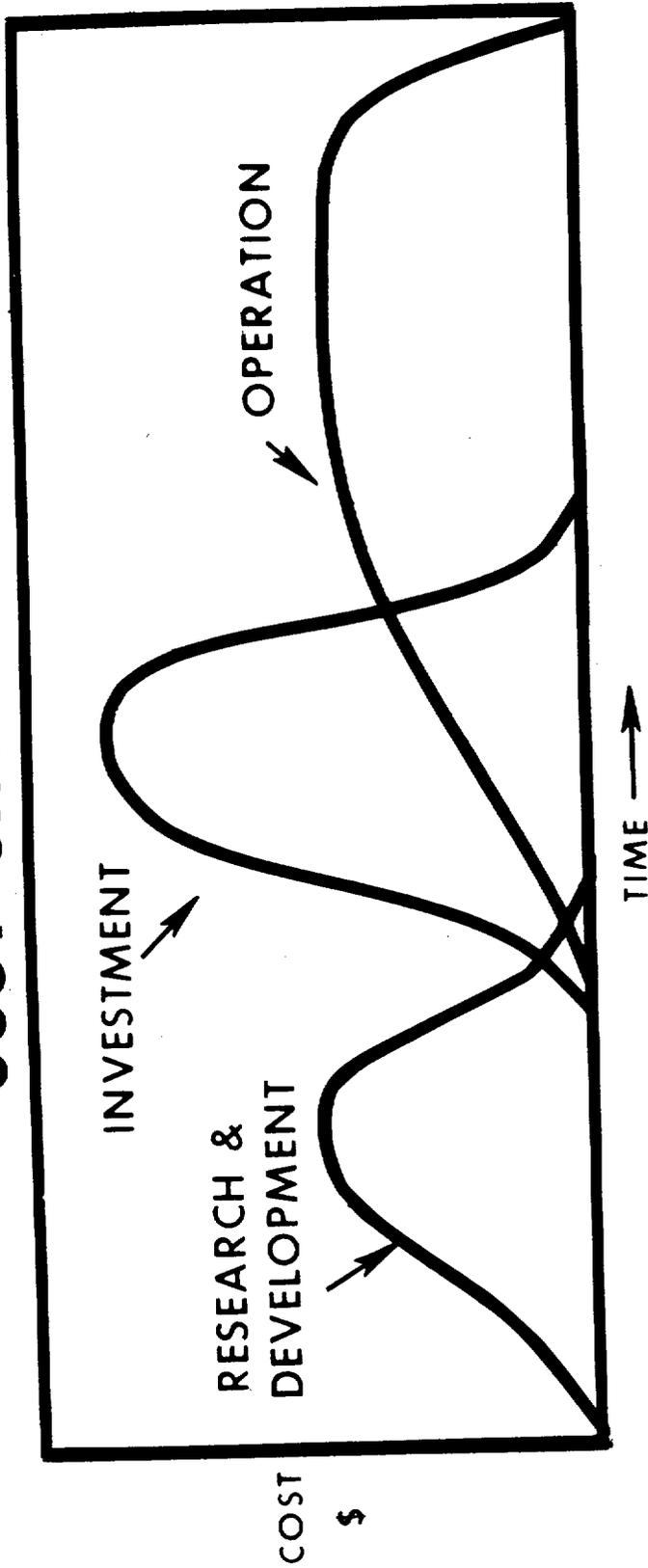


RESEARCH & DEVELOPMENT DEVELOPMENT OF A NEW CAPABILITY TO THE POINT OF INTRODUCTION INTO OPERATIONAL USE

INVESTMENT COSTS REQUIRED BEYOND THE DEVELOPMENT PHASE TO EQUIP FORCES WITH NEW CAPABILITY

CHART 12

COST CATEGORIES



RESEARCH & DEVELOPMENT DEVELOPMENT OF A NEW CAPABILITY TO THE POINT OF INTRODUCTION INTO OPERATIONAL USE

INVESTMENT COSTS REQUIRED BEYOND THE DEVELOPMENT PHASE TO EQUIP FORCES WITH NEW CAPABILITY

OPERATION RECURRING COSTS REQUIRED TO OPERATE AND MAINTAIN THE CAPABILITY

CHART 13

The specific administrative procedure for making these changes is known as the "Program Change Control System" (chart 14, page 21). The basic elements of this procedure involve the submission of program change proposals (or PCP's) by any major component of the Department of Defense, their review by all interested components, the Secretary's decision and, finally, the assignment of responsibility for carrying out this decision to the appropriate military agency.

In summary, this formalized program change procedure helps to ensure: (chart 15, page 22)

(1) that there is only one channel for major decision-making;

(2) that proposed changes receive a rapid, but complete, review, by all parties concerned;

(3) that program decisions are made on the basis of the best information available, including a validation of their long-range cost implications;

(4) that all major changes are made only after approval by the Secretary of Defense; and

(5) that there is always available an up-to-date, approved 5-year program for U.S. defense activities.

It should be recognized that the Programing System (chart 16, page 23) despite its complexities and interrelationships did not evolve slowly nor was it established as a precisely engineered, carefully tested system. Rather, the Secretary of Defense accepted the concepts and outlines of the system as proposed by Mr. Hitch and asked that it be installed almost immediately in 1961. We had to develop, extend, learn about and improve the system while we worked it, a most challenging and difficult assignment. Naturally, in this process there were gaps in the system and parts of it has to be dealt with by trial and error. In addition, many unforeseen problems emerged which has to be solved quickly and new ones are still appearing. Thus, there are a number of areas which require improvement and on which we are working at present. I would now like to discuss some of these with you.

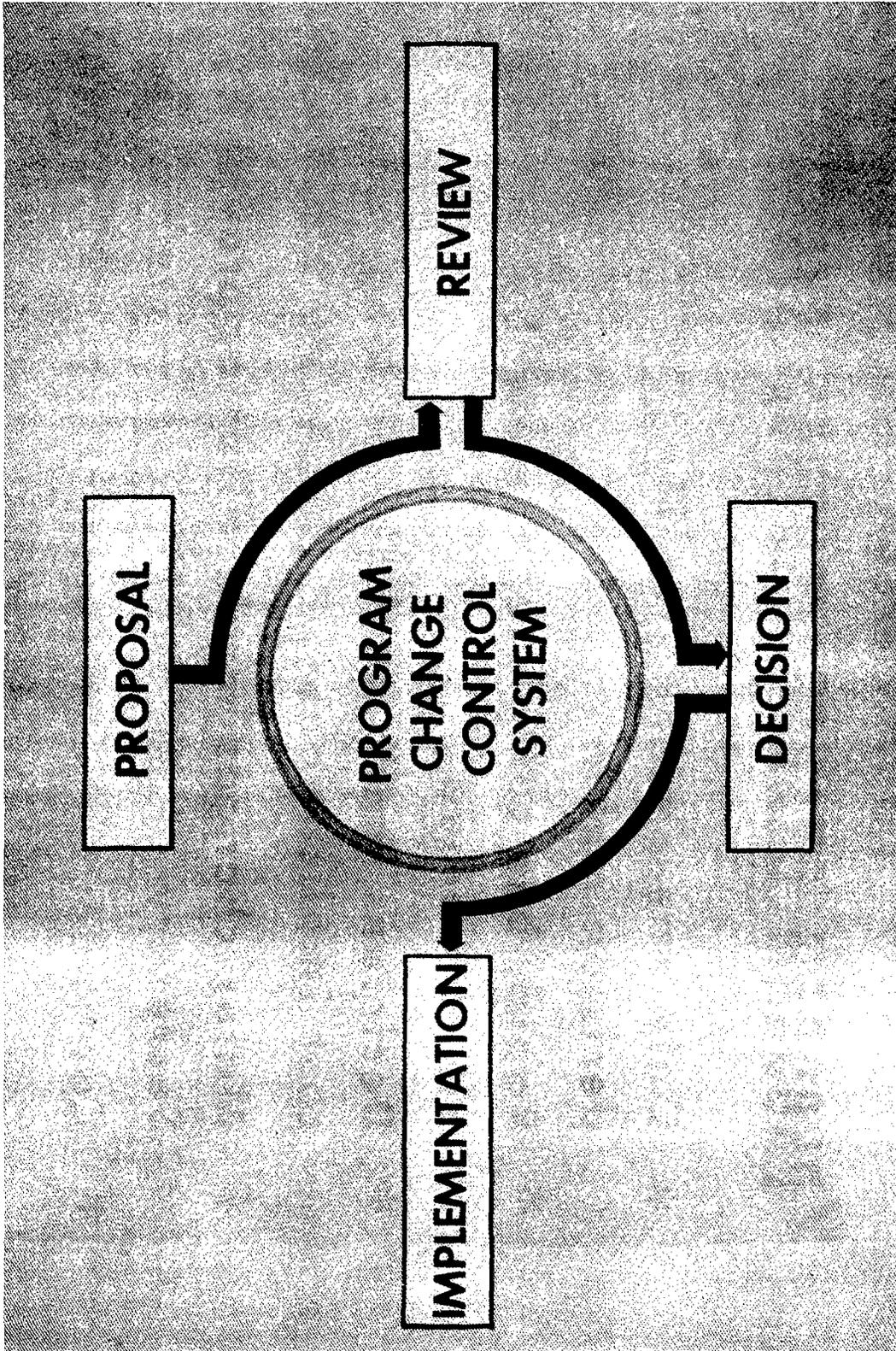


CHART 14

OBJECTIVES

PROGRAM CHANGE CONTROL SYSTEM

- * Only one channel for MAJOR decision-making
- * Rapid, but complete, review by all concerned
- * Decisions made in light of long-range cost implications
- * Major changes made after approval by Secretary of Defense
- * Continuously updated Five-year Program

CHART 15

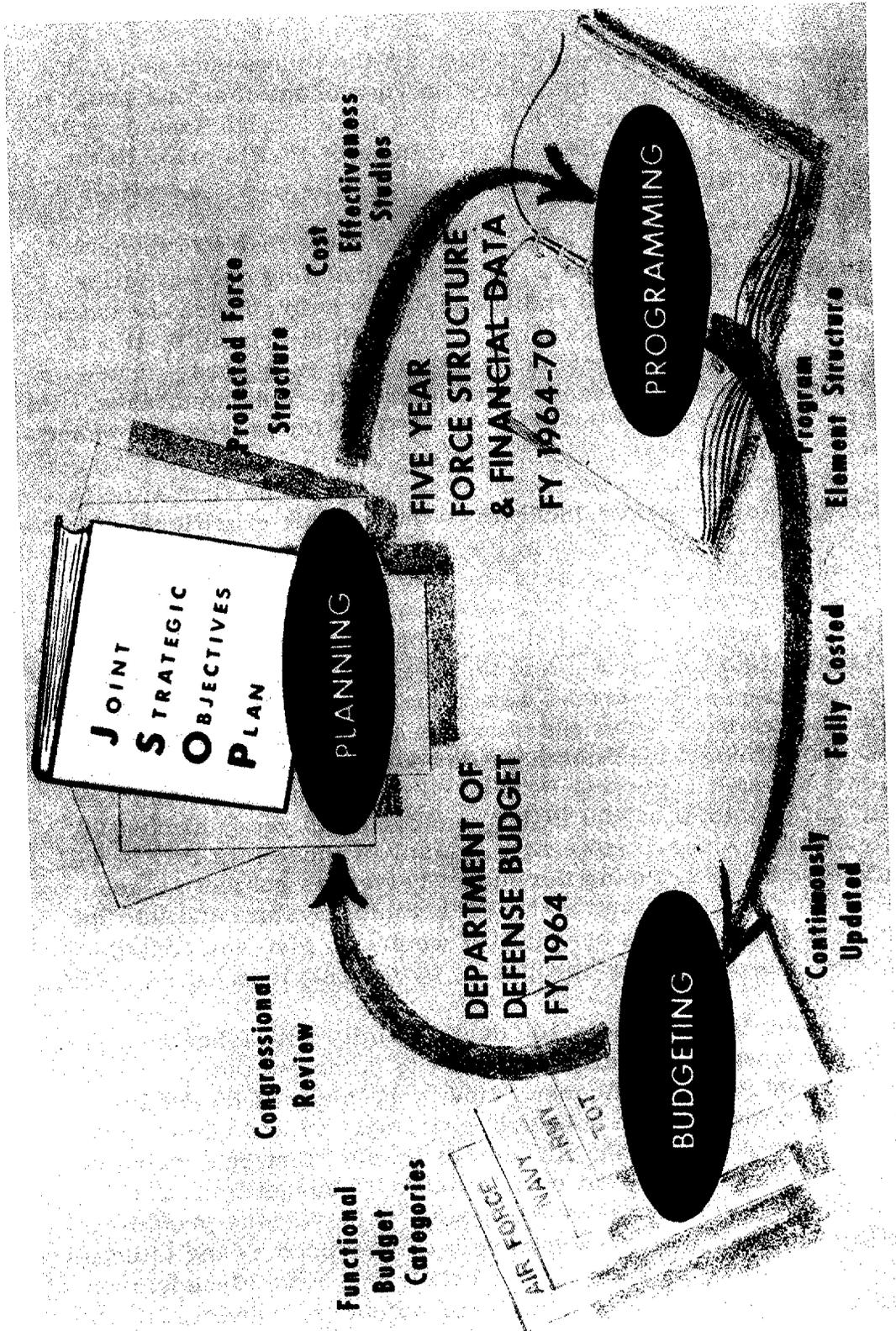


CHART 16

The problem of time phasing the actions of the Programing System has been formidable the past two and one-half years. We feel harassed in trying to accomplish all the things necessary, but especially at this time of the year. In view of the fact that programing is linked to the budget and the budget is tied to an annual cycle, there is always likely to be a large volume of PCP's prior to the annual budget review.

On chart 17, page 26, you see the schedule that was proposed in December of 1962 for the purpose of scheduling our activities during calander year 1963 and immediately below it are the dates that the events actually took place. Although in principle, it was an excellent schedule, the time permitted for each phase turned out to be insufficient for the accomplishment of the indicated tasks. For example, the first step, the delivery of JSOP force tabs was scheduled for 1 March but was not completed until 13 April. In a larger sense, this delay should be excused for this was the first time that the JCS agreed to a set of JSOP force tabs. This significant achievement, however, was the first of a series of slippages which had a chain reaction during the rest of the year.

The next significant period was 1 June during which the PCP's affecting the 1965 budget were to be submitted and in the hands of the Comptroller. This period was later extended to the end of June. Decisions were to be given the services by 15 August as a base for the 1 October budget submission. However, as some of you may know, we are still receiving PCP's and this is the end of October. In fact, out of a total of 400 PCP's received this year, almost 90 were submitted since 1 September. Many of these late PCP's will have to be dealt with during the budget review as subject issues. This transfer of PCP's out of the Programing System and into the budget review process is essential if we are to give any consideration to the "Eleventh Hour" proposals by the services for FY 1965.

Of the 400 PCP's, about 100 deal explicitly with force changes. We felt that it was especially important to complete the review of these force PCP's by 15 August. However, many of the PCP's that deal with forces have not yet been completed and returned to the departments for action. In view of the fact that each department was required to submit on 1 October its budget for FY 1965, the absence of force decisions has been a very serious problem. Not only is the budget review severely handicapped by the lateness of force decisions, but some of the PCP's that have already been processed are directly related to force numbers. Obviously, those

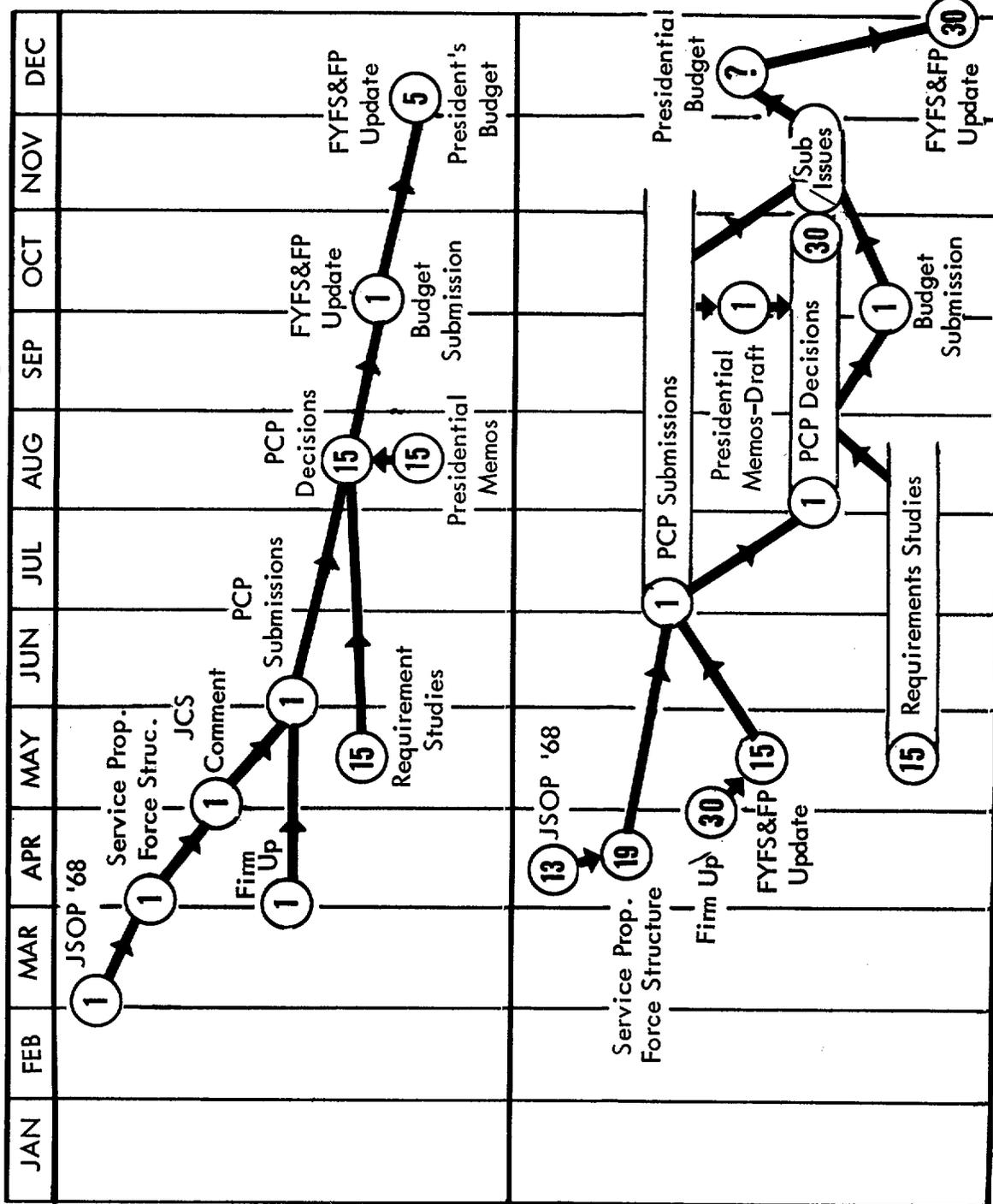
PCP's that are a function of force numbers should follow rather than precede the action taken on force PCP's.

Our experience thus far with the Programing System has clearly established the need to arrive at tentative force decisions earlier in the annual cycle. On chart 18, page 27, you see one alternative schedule that more appropriately time phases the necessary actions. There are probably several other schedules that would also serve our needs. In this particular one, the JSOP is again targeted for 1 March. It is my understanding that the service planners and the Joint Staff are hard at work now developing JSOP-69.

As in 1963, the services would again be obliged to submit their proposed force structures on 1 April--with one important difference. In 1964, this force submission would be in the form of an omnibus PCP complete with R. & D., investment and operating costs, and manpower by fiscal year and by major program. With each program submission, the services would be asked to explain the basis for proposed changes to the approved forces.

In calander year 1963, we first scheduled the services force submissions on 1 April. Because of the slippage of JSOP we extended this to 19 April and planned to wait through the month of June for individual PCP's for each of the proposed changes. We expected to review the forces in OSD during July and through mid-August. In this suggested schedule, by making the force submissions in April omnibus PCP's, we can hopefully save several precious months. In allowing two months for the OSD review, the proposed schedule would yield tentative force decisions by 1 June. As soon as the services receive these tentative force decisions, PCP's would be initiated for those program elements where OSD decisions differ from the Omnibus Force PCP, as well as for supporting activities that are a function of force numbers. Provision could be made for service reclamas to these tentative force decisions. The nonforce PCP's or other force adjustment PCP's could, of course, be submitted at any time in the year. The last date for submitting a force or a nonforce PCP that affected the next budget year would be 15 July. With such a schedule, we stand a better chance of completing the action on at least the major PCP's by 1 September.

CY 1963 PROGRAMMING SCHEDULE



PLANNED

ACTUAL

CHART 17

CY 1964 PROGRAMMING SCHEDULE

A SUGGESTED ALTERNATIVE

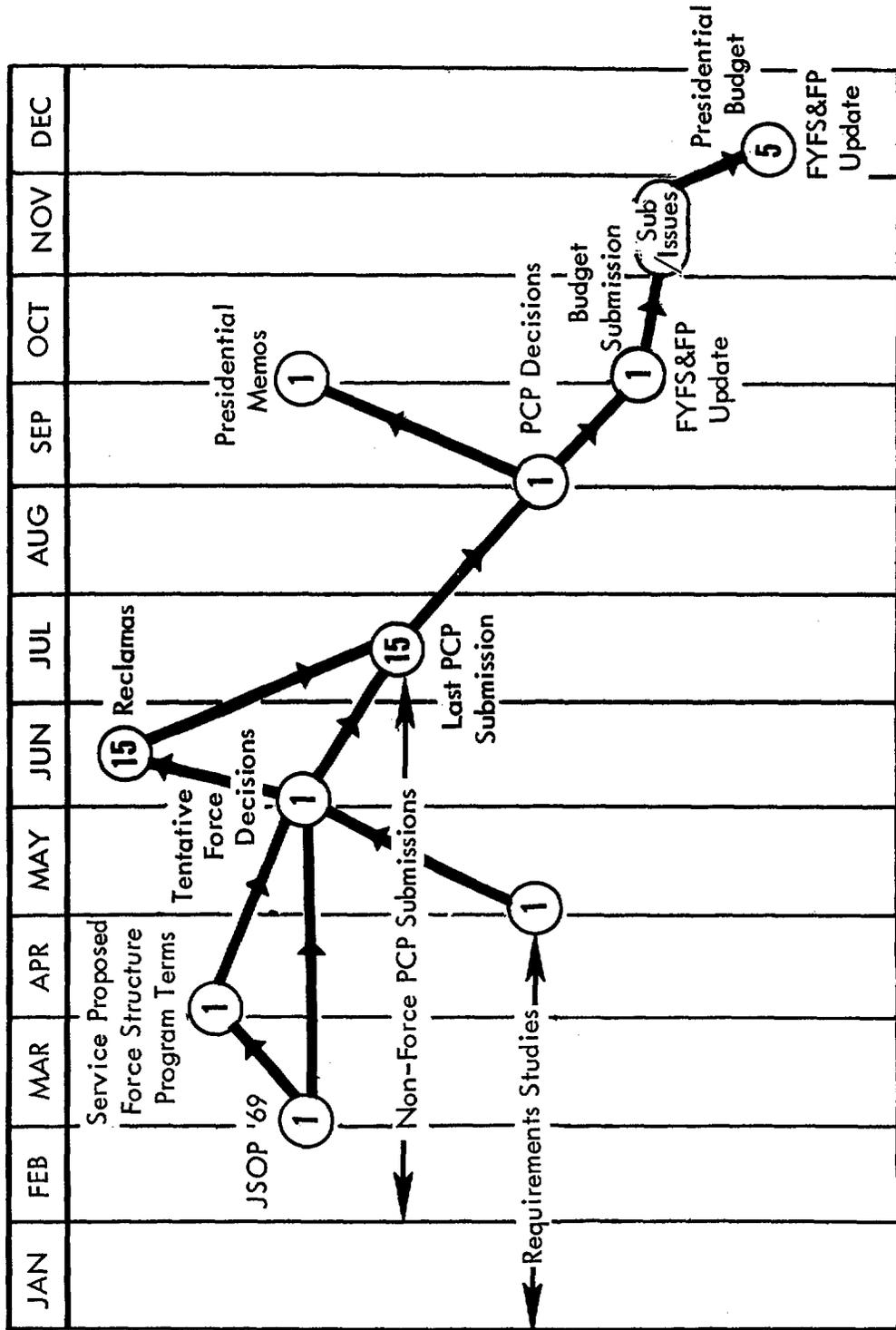


CHART 18

I would like to discuss next with you one of the ways in which Planning and Programing are related. Shown on page 32 is chart 19 that the Systems Analysis Office of OSD frequently uses to demonstrate a rather basic notion of Military Planning. The curve is assumed to depict the increase in military worth that is obtained from a given weapon as we procure and operate more and more of these weapons. The point here is simply that it is generally desirable to settle somewhere on the elbow of the curve because to the left of the elbow, significant increases in effectiveness can be achieved at relatively small additional cost whereas to the right of the elbow, negligible increases in effectiveness are quite costly.

On chart 20, page 33, you see a comparison of two competing systems, A and B. System A is preferred over System B when the funds available for the mission are assumed to be low. However, if sufficient funds are made available for the mission, System B eventually yields greater military effectiveness than A. The first segment of the System A curve and the second segment of the System B curve is the decision curve, that is, for funds greater than "X," the decision would go against A and in favor of B.

Now, how does one translate or program this type of an analysis into force plans over time? The "costs" on this chart are clearly not time phased. Thus, in order to perform an analysis like this, it is necessary, first, to pick a point in time at which military effectiveness is calculated and second, to accumulate the total costs to that point in time. As you can see, this is somewhat artificial. First, Systems A and B may be differently time phased which seriously complicates the analysis. And second, we are concerned with maintaining an acceptable military capability each year of the planning period--not just the arbitrarily chosen point in the future. Thus, we must carefully program weapons A and B over time.

Chart 21, page 34, is admittedly an idealized view of force planning but I believe that, in principle, it represents what we are striving to achieve. The chart may be viewed as representing two alternative ways of fulfilling a program requirement, such as Program I, Strategic Retaliatory Forces. In each case, the curve at the top represents the desired program capability and the curves marked A, B, and C, represent alternative program elements that compete to perform the mission of the program. In Alternative 1, Element A is phased out rather rapidly, a modest amount of resources are invested in Element B and a significant program for Element C

is assumed. In Alternative 2, program Element A is retained in the inventory longer, thus exploiting the fact that it is already in the inventory and, hence, requires only operating costs. The more significant emphasis is placed on Element B and relatively little resources invested in Element C.

The question for the decision-maker to resolve is, which of these alternatives is preferred? I have shown at the bottom of the chart the anticipated program cost over time resulting from the two alternatives, each of which yields the same level of program capability, or effectiveness. Alternative 1 is initially more costly because the older system, A, is phased out rapidly and the more expensive system, C, requires higher initial expenditures. Eventually, however, the greater effectiveness of C dominates the comparison and results in lower total program costs.

The ultimate decision depends upon many considerations, of course, including time and the uncertainties of the future. If the time scale is short, during which Alternative 1 exceeds Alternative 2 in cost then Alternative 1 would probably be preferred. However, if the time prior to the crossover is long, the decision-maker may not be willing to wait for the benefits of Element C in Alternative 1, due to the uncertainties of military planning and the rate of technological progress. At this point, there is no substitute for experience and mature judgment. The most sophisticated statistical techniques and computational procedures will not make the decision. But, the DOD Programming System, supported by the data and procedures of the military departments, will provide for the examination of many interesting and desirable alternatives on which, together with other considerations and staff advice, the Secretary of Defense may exercise his judgment.

The next topic I would like to discuss is what we refer to as the Planning Increment. The Five Year Force Structure and Financial Plan contains only those programs and activities that have been explicitly proposed for inclusion by the military departments and other DOD components and approved by the Secretary of Defense. One of the rather obvious problems we face, therefore, is that no component can anticipate all of the programs and activities that will, in fact, be supported several years hence. For example, in the area of research and development, we are able--with some difficulty, of course--to project fund requirements for projects that have already been initiated and are in the current 5-year program. However, it seems likely that during the next five years,

projects will be proposed in the research and development area that are not now included in the 5-year program. The result is that we see a comparatively small, artificial decline in the approved Program for research and development. As you can see, the decline for the most part, takes place in the R. & D. support of operational systems, although the R. & D. category of Engineering Development experiences a similar decline, see chart 22, page 35.

It is also apparent from an analysis of the 5-year program that the "Total Investment" category shows a large, and similarly artificial, decline. The reason is that some of the programs now reflected in the Research and Development Program will be approved during the next several years for operational deployment. But, until that approval is given, the investment category is probably unrealistically low.

In order to deal with this problem, the Secretary has requested that he be provided with what has come to be known as the "Planning Increment," chart 23, page 36. This increment, estimated by fiscal year, is not a part of the approved 5-year program. Rather, it consists of the best judgment of the Secretary as to the amount by which the approved program understates the Total Obligational Authority that will be required during the next five years. Incidentally, this problem is not unique with the U.S. Department of Defense. Other countries have informed us that they are faced with similar problems.

To better understand the problem, let us examine the elements that, at least in principle, comprise this planning increment. I have already mentioned that the categories of Research and Development Investment in new systems represent areas of potential understatement of TOA. The need to include an R. & D. and Investment planning increment should be apparent. Suppose, for example, that a decision has already been made to undertake a given engineering development project in Program VI. This decision should be based on many considerations. One of these considerations ought to be not only the total RDT&E funds that will be required but also the estimated costs to procure and operate the system if the program turns out to be successful. Thus, the level of effectiveness promised by this new system, in comparison with competing systems, should justify not only the RDT&E funds that have been approved, but also the procurement and operational funds that are yet to be approved. Obviously one would hesitate making a positive research and development decision if there were considerable doubt as to

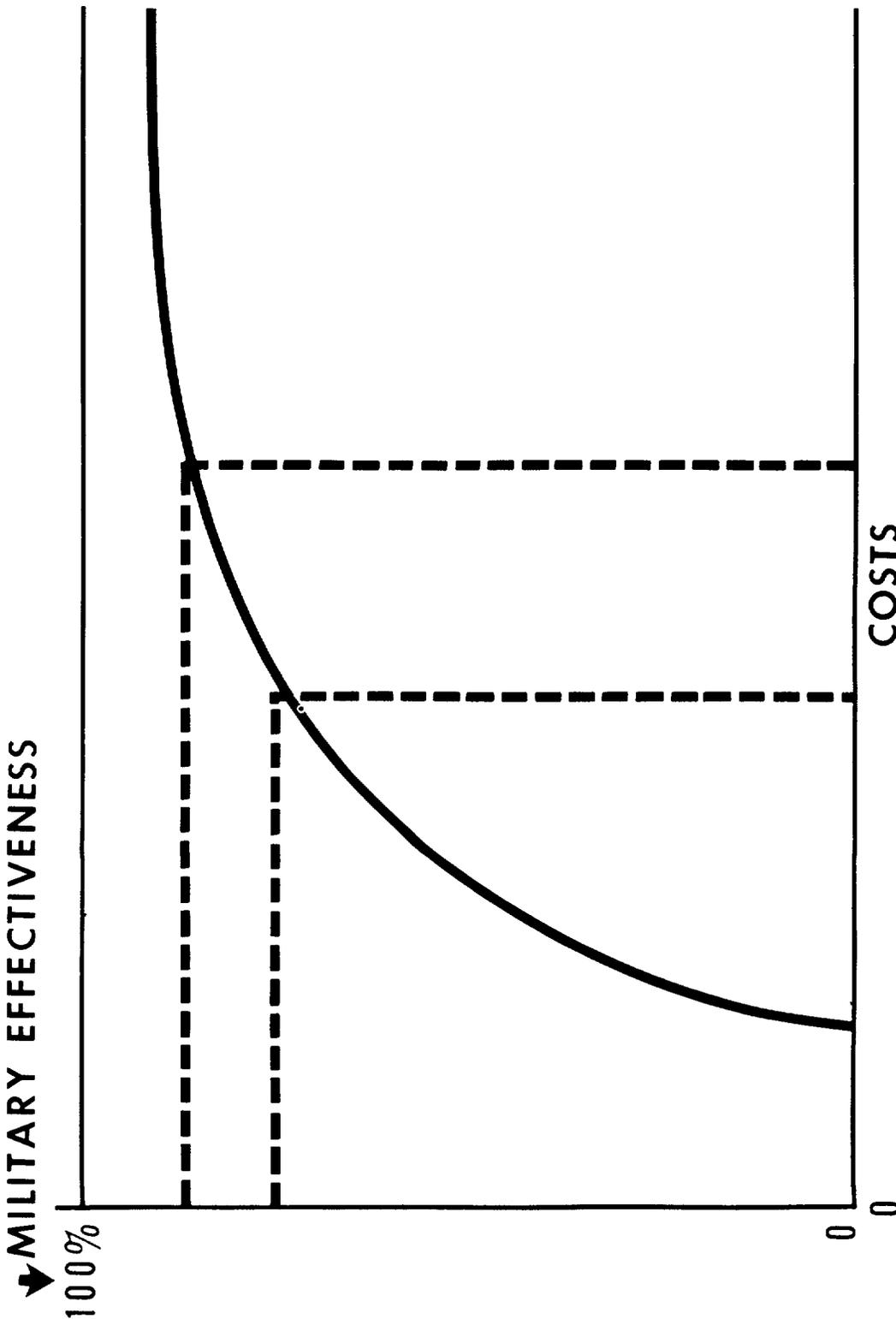
whether we would be willing to incur the investment and operating costs that follow. I am aware that many development programs are of the research and test variety and are not viewed as having a direct application to the operational inventory. I am also aware that, for those R. & D. programs that do have a direct application to the operational inventory, inevitably, not all of them will be carried through to deployment for various reasons. However, each one of these--taken separately--must be examined in terms of its potential TOA requirements on the assumption that its R. & D. program is eventually concluded successfully.

It is no doubt true that if we added up all of the projected and not yet approved investment and operating costs for the programs currently in Program VI, the TOA for the Department of Defense would rise to unacceptable levels. The problem, therefore, is to determine, in carefully constructed technical as well as cost-effectiveness analyses, the magnitude of the planning increment that would provide a sufficient hedge for alternative sets of the most promising development programs.

I would like to mention, briefly, two more pieces of the planning increment. One of these I have chosen to call "Deferred Commitments." On several occasions, the Secretary has made a positive decision to fund an activity in the next budget year, but has withheld approval of TOA for subsequent years pending a detailed study of the resource needs of the activity or its relationship to similar ones in one of the other military departments. The objective here is simply to include in the "Planning Increment," estimates of the TOA for all of these deferrals in order for the Secretary to have a more realistic view, at least in principle, of the commitments he has made.

The last part of the Planning Increment I have labeled "Program Underestimates." Much has been said and written concerning the tendency for early program estimates to understate actual costs by significant amounts. This I consider to be an extremely important problem which deserves much more discussion than I am able to devote to it here. Suffice it to say that we must attempt, with whatever techniques and data we can muster, to forewarn the Secretary as to the magnitude of such underestimates. Although we do have the option, in cases of significant underestimates, to cut back to the approved TOA, it seems reasonable to estimate what additional TOA might be required if the approved programs were carried through as planned.

COST EFFECTIVENESS



COSTS

CHART 19

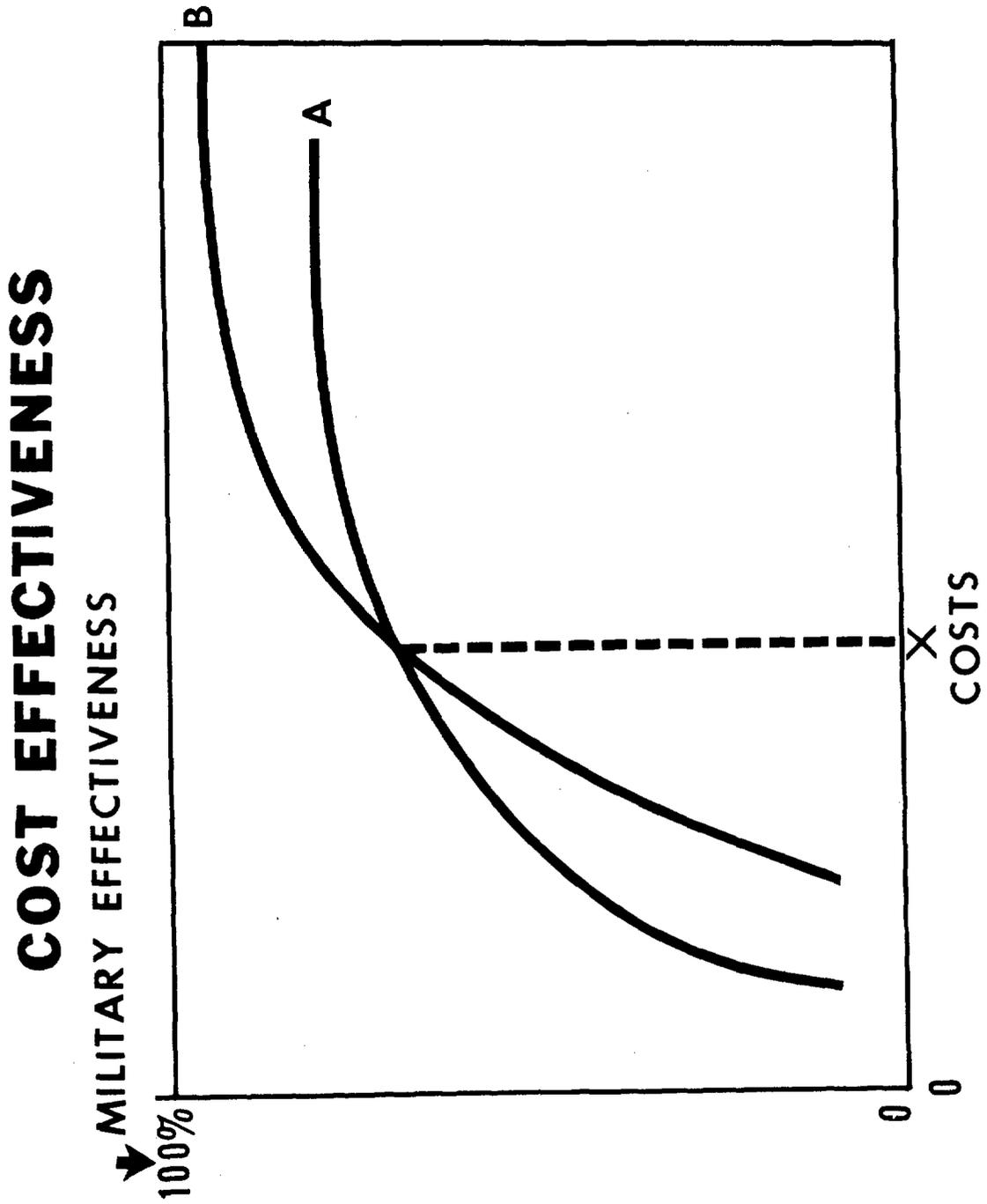
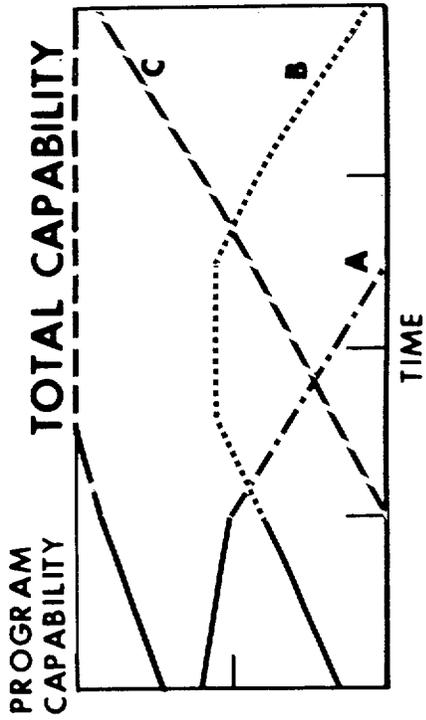


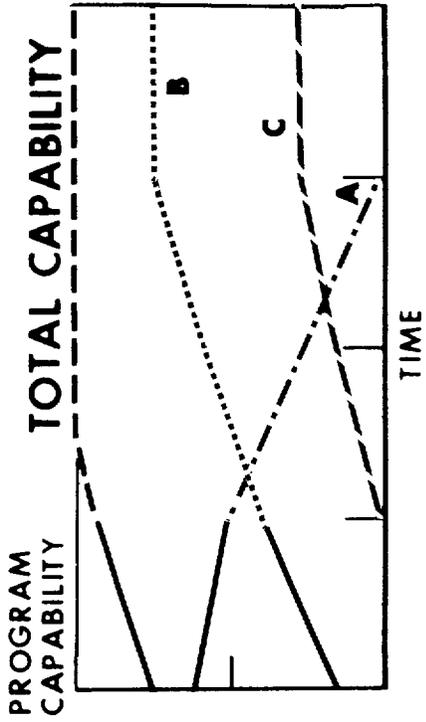
CHART 20

PROGRAM X ALTERNATIVES

ALTERNATIVE I



ALTERNATIVE II



COMPARISON OF PROGRAM X ALTERNATIVES

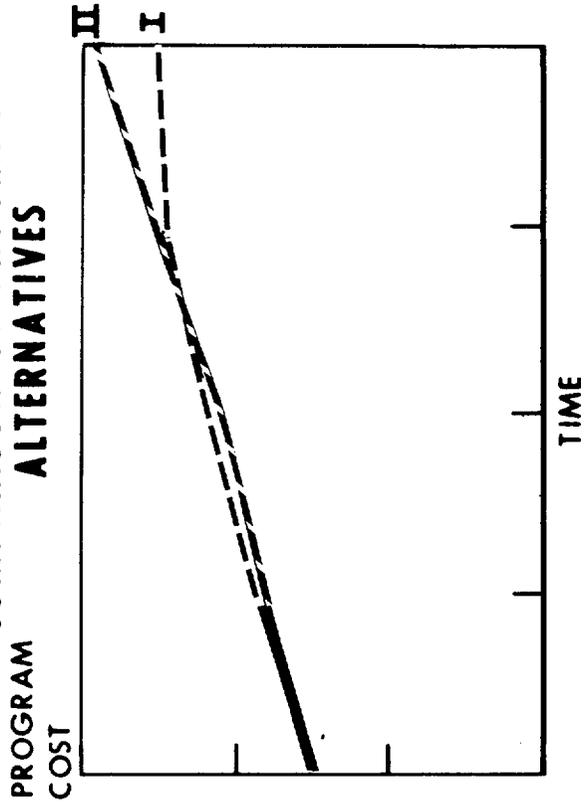
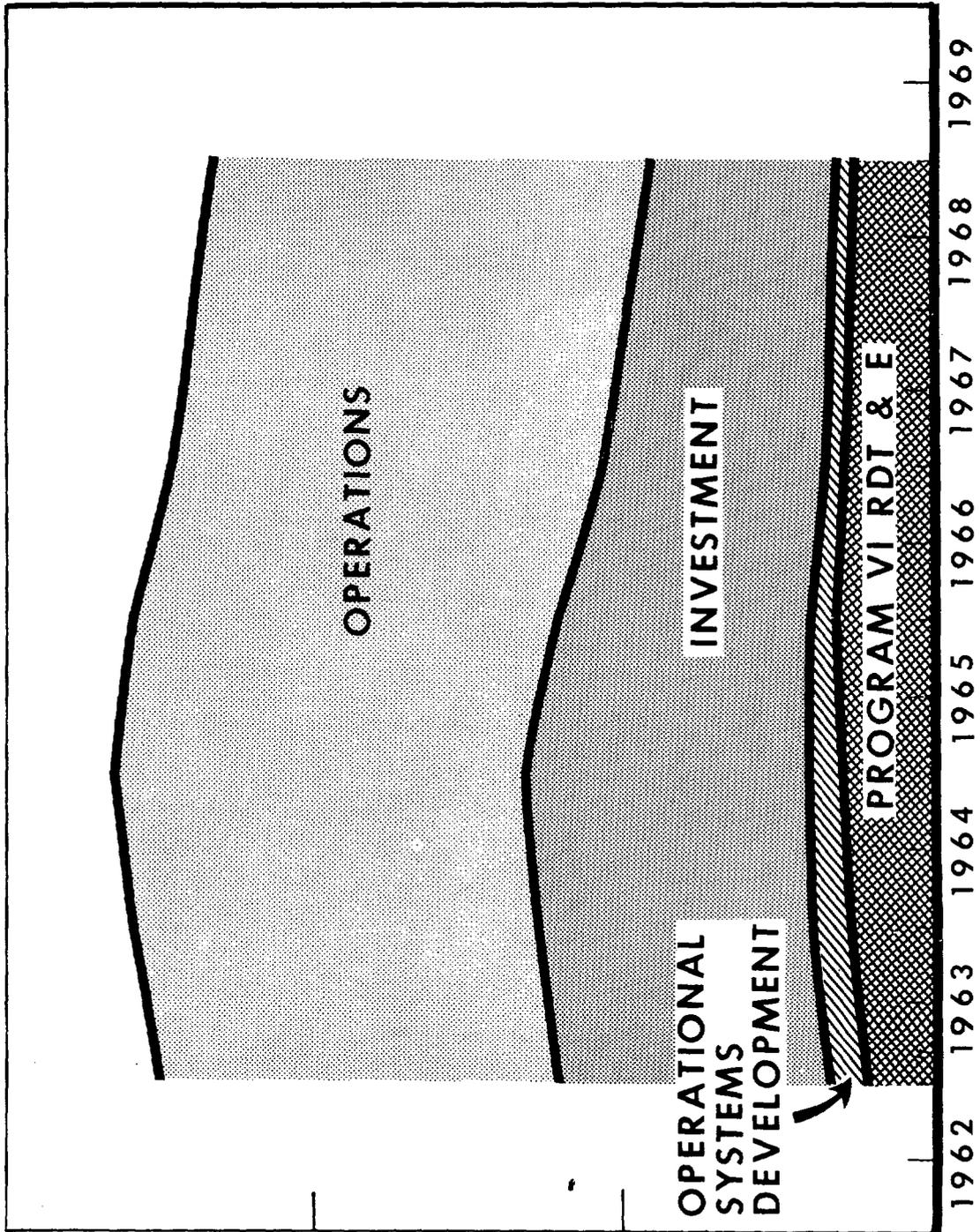


CHART 21

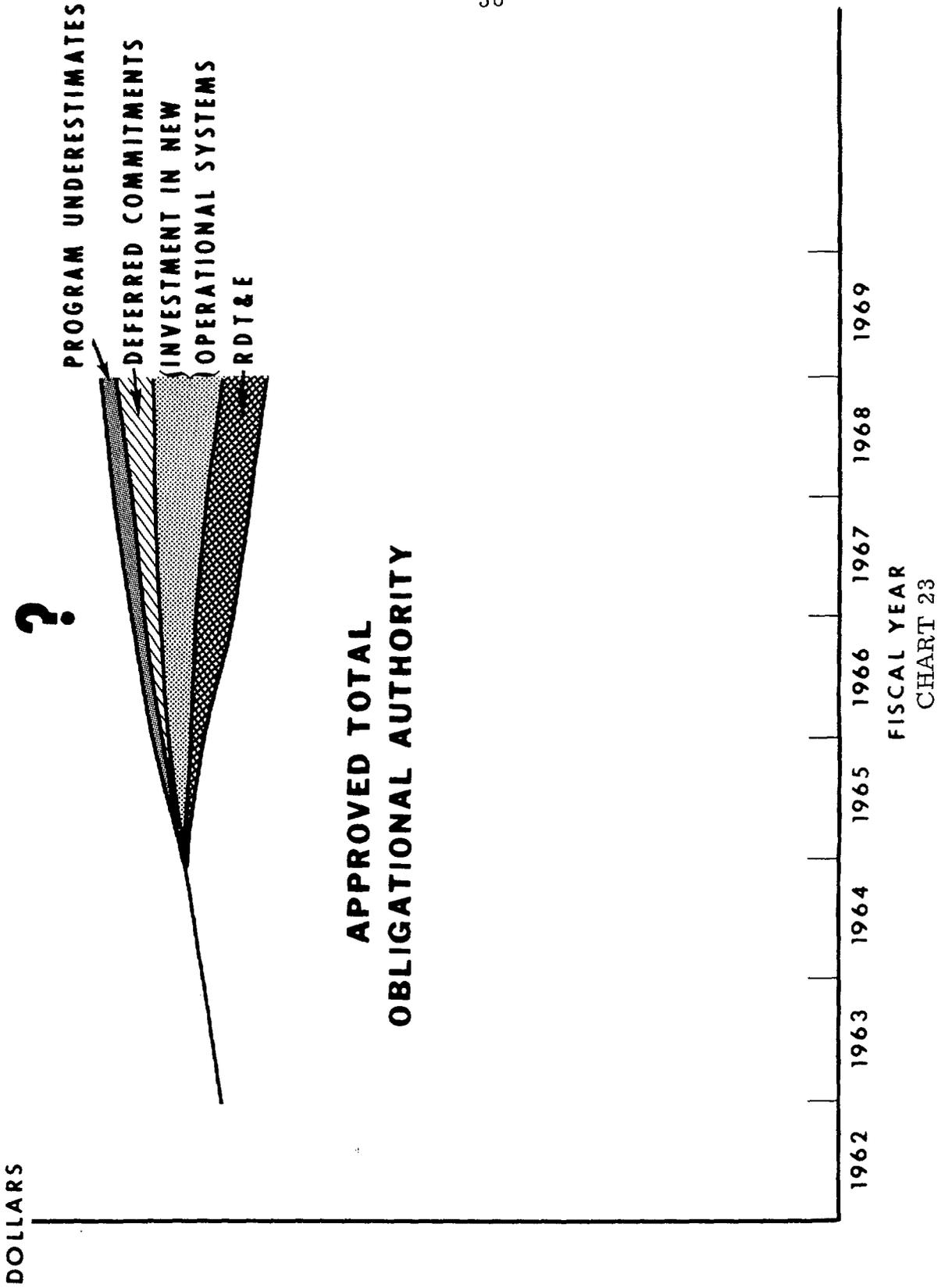
APPROVED TOTAL OBLIGATIONAL AUTHORITY TO A



FISCAL YEARS

CHART 22

THE PLANNING INCREMENT



APPROVED TOTAL
OBLIGATIONAL AUTHORITY

This, then, is the Planning Increment. It is not a part of the official Five Year Force Structure and Financial Program. It merely provides the Secretary with a more realistic view of the future as a context for current decisions.

As has been stated earlier, one of the principal reasons for the development of the Programing System was that the budget or appropriation structure did not present financial data in the terms in which decisions were made. Crucial decisions were being made in terms of missions, forces and weapons systems, while the appropriation structure was primarily functional and dealt with Military Personnel, RDT&E, Construction, Procurement and Operations and Maintenance. However, although the Programing System deals with missions, and the management of forces and weapons systems to accomplish the missions, the appropriation structure is equally useful in the management of resources. Aside from the fact Congress requires us to present our budget in the traditional format, the budget structure also provides a useful tool in the current year management of manpower, facilities, equipment and money--the requirements of every day living. Although it was not a simple task, and the fit is not perfect, we have developed an interface between programing and budgeting through a series of matrices. Chart 24, page 42, illustrates this point. It should be understood, however, that even though we have learned to manage in program terms and in resource terms, and have also developed an interface between the two, difficult problems still arise. Ideally, once we establish or approve a specific program, we should also assign the resources to carry out the program, and in most cases we do. But, since funds and manpower are both limited in the current or budget year, we cannot automatically increase dollars and manpower for important and desirable new programs. We must reprogram within Congressionally approved funds from less urgent or lower priority programs. In most cases this is difficult to do--since all approved programs have undergone a hard review for importance and necessity and may already reflect some degree of austerity.

Another facet of this problem is that decisions are sometimes made purely in resource terms for a variety of reasons unrelated to program requirements. A typical example of such a decision may be one to reduce military or civilian manpower, DOD-wide. Obviously, such a decision has a direct impact on programs and must be appropriately reflected in program element terms. The services have indicated, on a number of occasions, the difficulties

they face in trying to resolve such resource decisions which are not always compatible with program decisions. There are no easy solutions for this problem. But as a practical matter, there are times when purely resource decisions must and will be made. The Programing System must recognize these facts of life and I am confident that we shall achieve the necessary responsiveness.

Another major problem in the establishment of the Programing System, and one that still faces us today, is that the reporting and data collection systems of the military departments and agencies are not keyed to the programing structure. Although the present programing system is comparatively new, in a broad sense, the problem is an old one. Traditionally, data available to top management have always lagged behind the needs for management information. Data systems are costly and take a long time to develop and implement, especially in an organization as large, varied and complex as the Defense Department. Further, when once developed, they are not susceptible to quick change and because of the effort involved there seems to be a resistance to change. Thus, there is present a strong tendency to "make-do" with what is readily available, rather than to request new or additional information.

All these factors were present with the establishment of the Programing System, a system which created a whole new spectrum of data requirements. First, the Secretary of Defense used the system to examine service activities to a greater degree than had his predecessors, with a corresponding increase in data requirements. Second, the new system required different kinds of data than the services had been accumulating. I will say more about this in a moment. And third, the system required data uniformity from the three military departments to an extent which was virtually nonexistent. This is not meant as criticism, but it seems to highlight some of the problems. The reasons are apparent. For years, each service had developed its own information system to fit its own management needs. Since the services had different roles and missions and were organized differently, their management and information systems were also different, although in the financial area they tended to be built around similar appropriation and accounting structures. The Army, for example, had spent almost ten years in developing, installing, revising, and improving the Army Command Management System. This is a comprehensive financial management and information system, which is now deeply imbedded in, and very basic to, Army management. Yet, the ACMS is so constructed and organized that it can only partially and indirectly meet the data needs of the Programing System. Instead, new and

parallel data systems have had to be developed and installed at a very considerable effort. This great effort by Army personnel has been, no doubt, matched by Navy and Air Force personnel in trying to accommodate their systems to the needs of the Programing System.

Why does the Programing System impose seemingly unreasonable data demands upon the three military departments? As you know, the Programing System places before the Secretary of Defense the major units about which decisions must be made--Air Force aircraft and missile forces, Navy ships and aircraft, and various types of Army divisions, regiments and battalions. Now, suppose, for example, that the Secretary is considering the addition of one mechanized division to the Army's forces. He needs before him, among other things, an estimate of the TOA that will be required to procure the appropriate equipment, personnel and facilities, and to operate this division each year after its activation. This means that, to the maximum extent possible, the costs that will be incurred by this new division should be generated as a direct function of the personnel, equipment, and facilities required for this division. Unhappily, the data currently used by the Army do not permit this type of direct attribution of costs. To some extent, this is also true of the other two military departments. Thus, how can an intelligent decision be made in my hypothetical example if we do not know what costs would, in fact, be incurred if we added this new division? The estimates we now have are simply allocations based on personnel and, hence, ignore the uniqueness of a mechanized division. For example, I have found that in the data submitted to OSD, the cost to operate a mechanized division for one year is shown as the same as for an infantry division. Yet, the latter, has less expensive and complex equipment to maintain, thus implying, intuitively at least, a lower operating cost.

Interesting enough, much of the data needed may be available at the lower levels of the three military departments, but the specific reporting systems for transmitting the data to the higher command levels have not been established. For example, detailed information on maintenance and repair costs of many types of equipment, is kept at the installation level where such activities are performed. This is very useful for estimating current and future costs of the program elements containing such equipment, but this information is not now transmitted to higher command levels where programing data is assembled and summarized. I would like to make one point clear in this connection. I am not talking

about instituting accounting systems to bring all of these detailed records up to the Departmental Headquarters. Cost estimates, for example, to maintain all major pieces of equipment in a mechanized division could be developed by sampling cost records at selected installations. The total cost of maintaining all of the major equipment assigned to the division could then be obtained by merely adding the estimated cost of maintaining each piece of equipment in the program element.

I have made the solution to the data problem sound overly simple, although to be sure, data problems in the Pentagon are rarely solved easily. But, with the continuing assistance and participation of the military departments, I am confident that considerable improvement in the data for the Five-Year Program can be achieved.

As I pointed out in my remarks dealing with the relationship between Planning and Programing, one of our objectives is to be able to generate numerous alternative force structures for examination. The availability of such alternatives would be especially useful for the purpose of arriving at tentative force decisions.

In order to compare alternative force proposals with the approved forces, it is essential to have computational procedures that will, relatively quickly, yield estimates, by Fiscal Year, of TOA and manpower as functions of force levels, activity rates, deployment and other critical force variables. The present methods by which the three military departments calculate estimated TOA and manpower for the various program elements, especially those involving forces, are not sufficiently rapid or responsive to satisfy this need. The procedures that do exist are adequate for the calculation of costs and manpower for the approved 5-year program. However, for the initial consideration of several force alternatives, the current procedures are rather slow and unwieldy.

In order to fill the need for rapid computational procedures, OSD has asked each of the three military departments to develop what has come to be known as "cost models." These models are computerized procedures that generate TOA requirements by fiscal year for specified forces. Actually, the services have moved reasonably far in the development of such models. The Air Force has had the benefit of a model developed by the RAND Corporation a number of years ago. This model is currently installed at Air Force Systems Command. RAND also developed a cost model for the Army, which was completed last May, and has been turned over

to the Army for implementation. The Navy has had such a model under development in CNO for over two years and appears to be making good progress. OSD must now take a more active role to insure that there will be some degree of consistency among the three departmental models, see chart 25, page 43.

I have indicated to you that most decisions are made in program terms and that the primary decision unit is the program element. But, this is only part of the picture. Many decisions are also made in terms of items.

As you all know, our supply systems provide for management by materiel category and over the years this has been found to be an effective way to manage items of supply. Supply requirements are not calculated in terms of individual program elements, but rather by factors which have been developed by long experience. It is not my intent today to discuss these materiel systems, but to recognize that they do exist and are an integral part of defense management. I would prefer, perhaps, the calculation of materiel requirements by program element, and, in a building block fashion, would like to be able to total these to come up with an aggregate requirement for any item. In programming terms, this would be a nice, neat simple way to compute investment costs. However, this is not likely to happen for a long time, if at all. In the meantime, we are faced with the need to assign costs to program elements for items which are common to many programs.

For the present, costs for common items are obtained by allocation or distribution using a variety of factors, the most common one being military manpower. Other factors could be flying hours for aircraft elements or steaming hours for Navy ships. Obviously, such distributions are not very precise and in some instances give a very distorted picture. Until we do achieve a building block capability, we can only work to improve the factors. This, incidentally, could have a bonus effect, for the same factors might be used for the service cost-models.

Department of Defense
 FY 1964 BUDGET PROGRAMS AND NEW OBLIGATIONAL AUTHORITY
 By Appropriation Title
 (Millions of Dollars)

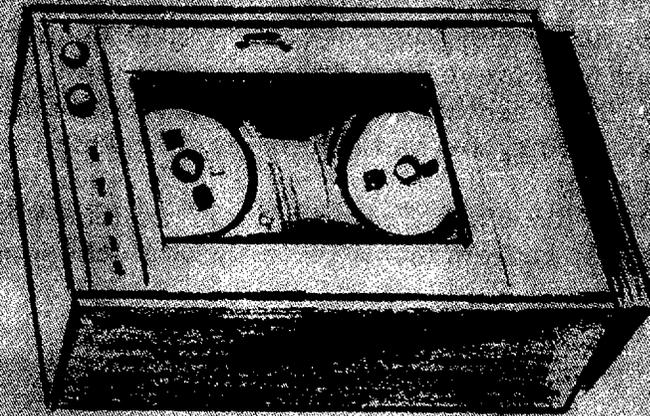
Appropriation Title	Continental		General Purpose Forces	Total Programs (TOA)	Financing Adjustments	New Obligational Authority (Appropriation)
	Air and Missile Forces	Defense Forces				
MILITARY PERSONNEL						
Military Personnel, Army	-	92.6	2,626.0	4,035.0	-150.0	3,885.0
Military Personnel, Navy	56.2	48.9	1,569.6	2,796.0	-120.0	2,676.0
Military Personnel, Marine Corps	0.2	0.6	487.1	678.6	-	678.6
Military Personnel, Air Force	1,132.4	485.4	620.0	4,178.0	-30.0	4,148.0
Reserve Personnel, Army	-	-	-	210.1	-	210.1
TOTAL - Military Personnel	1,188.8	627.5	5,302.7	14,435.2	-300.0	14,135.2
PROCUREMENT						
Procurement of Equipment and Missiles, Army	-	75.6	2,711.5	3,316.0	-114.0	3,202.0
Procurement of Aircraft and Missiles, Navy	672.5	3.9	2,323.4	3,111.0	-45.0	3,066.0
Shipbuilding and Conversion, Navy	702.3	-	1,629.0	2,381.3	-71.3	2,310.0
Other Procurement, Navy	133.4	99.4	748.4	1,231.5	-23.5	1,208.0
Procurement, Marine Corps	-	-	176.1	221.6	-13.9	207.7
Aircraft Procurement, Air Force	641.4	103.9	1,395.1	3,956.5	-397.5	3,559.0
Missile Procurement, Air Force	1,974.4	17.3	206.3	2,405.0	-228.0	2,177.0
Other Procurement, Air Force	142.7	191.9	253.0	1,006.3	-54.8	951.5
Procurement, Defense Agencies	-	-	-	43.6	-	43.6
TOTAL - Procurement	4,266.7	492.0	9,442.8	17,672.8	-948.0	16,724.8
GRAND TOTAL - MILITARY FUNCTIONS	7,284.8	1,977.0	19,100.0	55,183.5	-1,522.9	53,660.6

CHART 24

COST MODELS

"INPUTS"

- Force Structures
- Logistic Policies
- Personnel Policies
- Procurement Schedules



"OUTPUTS"

- COST ESTIMATES
- TIME PHASING
- RESOURCES

CHART 25

One of the problems we face is that most PCP's propose increases in dollars or manpower or both, and our resources are not unlimited. Quite understandably the services are always trying to improve or increase their programs to be able to do a better job of defense. Also, technological improvements are costly and it is rare that you can improve performance at lower cost. Thus, even if the PCP proposes a direct substitution of a new system or item for an old one, the cost of the new is generally up.

There are solutions to this problem and they include appraisal and reappraisal of our objectives and programs for attaining them, and consideration of alternative means for achieving our objectives with the aid of cost-effectiveness criteria. Specifically, in order to guard against monotonically increasing Defense expenditures, we have initiated broad program reviews in addition to the customary budget reviews. The program review is a reappraisal of the force numbers and the TOA required for these forces in the light of new intelligence, new technology, et cetera. The budget review, as you know, is an attempt to achieve further economies via the budget appropriations in the implementation of an annual increment of the approved force. Last spring, we had a third review which was called "Firm Up." The objective of "Firm Up," among other things, was to reflect in the Five-Year Program those actions taken during the previous budget review that affected years subsequent to the budget year.

Thus, but the three types of reviews--force reviews, budget reviews, and "Firm Up"--we have tried to deal with the fact that most PCP's propose additions to the approved program. It is hoped that in the future, the services will, themselves, weed out certain forces or activities that have for various reasons ceased to warrant continued support. Actually, this has occurred in a few instances. However, until this practice becomes more prevalent, the need will continue for some kind of OSD review.

As a footnote here, I should add that the force review has other objectives--such as effecting a better balance of forces among the three departments. Such a review does aid significantly in identifying areas where reductions, as well as increases, are needed.

Finally, I would like to acknowledge a complaint that I have heard a number of times, that the Programing System has generated a large volume of paper, and among all of these papers,

important matters are given as much time as items of a comparatively trivial nature. This paper volume is indeed a matter of concern, and we are doing our best to cut it down. However, the paper requirement is not entirely a disadvantage. It forces program change proposals to be thought out carefully and in detail. It provides for the consideration of other factors related to the requested change. It provides for inputs and analyses by all interested staff elements, and it tends to prevent hasty decisions based on incomplete data. Nevertheless, we are continuing to seek means for reducing the paper load to a reasonable minimum.

It is, of course, also true that relatively small dollar change proposals are often given equal attention as the larger ones. For example, a construction item change of \$1 million requires PCP submission as does a \$1 million change in the Military Assistance Program. To process these in the same manner as a proposed force change to, say, the Polaris program, seems inappropriate. Yet, it is the Secretary of Defense who has set the thresholds for matters requiring his approval, and by so doing indicated those which he wants brought to his attention. The thresholds are low for construction and military assistance items, because these matters receive very careful Congressional scrutiny, and the Secretary wants to be fully informed on them. Similarly, close surveillance is maintained over manpower changes, another item of rather general concern. Inevitably, matters of varying importance will be dealt with in the System, but this is fully recognized. If the Secretary of Defense is required to be familiar with small as well as large items having Congressional significance, the Programing System can and, in fact, must be responsive to this requirement.

These, then, are some of the major areas on which we are concentrating our effort to improve the Programing System. To assure you that life with the new System has resulted in a few successes as well as problems, I would like to conclude my remarks by summarizing, briefly some of the accomplishments to date, see chart 26, page 48.

First, the Programing System is firmly established throughout the Department of Defense. All activities throughout the military departments, the Defense Agencies and other DOD components are reflected in the Programing System Structure. The system focuses in the Office of the Assistant Secretary of Defense (Comptroller), and the military departments and agencies have counterpart organizations. They have developed and implemented comprehensive

reporting and data systems and appropriate procedures to support the Programing System. In addition, the military services have developed large scale computer programs also in support of the Programing System.

Second, the Secretary of Defense is using the Programing System as his principal management tool for decision-making. I would not want to give the impression that this is his only such vehicle, but it is true that this is his main frame for decision-making. Also decisions made outside of the Programing System which affect programs are folded into the system through a simplified PCP mechanism. The Secretary makes constant use of his summary copy of the Five Year Force Structure and Financial Plan, and the system provides that either he or his deputy personally sign the document approving, disapproving, or modifying all program change proposals.

Third, the Secretary of Defense uses the program structure format, and the data generated in programing terms, for his annual budget presentation to Congress. He finds this more effective than the traditional presentation in appropriation terms. There is good evidence, too, that Congress likes this format and finds it useful for their purposes.

Fourth, the Bureau of the Budget has watched the development of the DOD Programing System with much interest and now desires to extend the concepts of programing and multiyear planning to other government agencies. To this end, they have developed a draft circular and are presently distributing it for comment.

Fifth, NATO has become very much interested in the Programing System and have asked for assistance in applying it to the NATO defense forces. Mr. Hitch and a party from the Pentagon visited Europe this past summer to explain the system to the NATO countries, and they, in turn, have sent representatives here to observe how the system functions in our own defense establishment. We feel that if our allies use a system similar to ours, it will greatly facilitate the development of our combined defense forces.

Sixth, we have achieved one of the most important objectives of the system, and that is--to establish an effective link between military planning and budgeting. If you recall, I mentioned earlier that the military planning and budgeting had been performed almost entirely in their own spheres and with little or no coordination. Now,

programing has been able to apply resources and schedules to military planning and in so doing has provided the basis for the development of the annual budget.

Seventh, although this was not true earlier, the services are now beginning to use the programing system for their own management purposes. This is important, for the service investment in the Programing System is quite large. Originally, the services were wedded to their own carefully developed management control and information systems, but are now in process of examining and revising them in programing system terms.

Eighth, the doctrine of cost/effectiveness has become firmly established in the decision-making process. In most defense problems today, the range of choices and alternative solutions are given much more careful consideration than they were previously.

Ninth, is an internal accomplishment. We have successfully mechanized the data in the Programing System. To us this is a vital step forward because of the tremendous volume of information included in the system. Mechanizing the system has given us a capability for fast reaction in accumulating data and it has also made available for analysis purposes much more than we have had before.

In conclusion, I would like to say that when we look ahead, we are sometimes overwhelmed by the magnitude of the tasks that still face us. The mountain in front never seems to get smaller. However, when we look back at what has been done and how far we have come, then we can see that we are making some progress. With the valuable cooperation of the military departments, I am confident that this progress will continue.

(18 December 1963--500)O/pd:en

SOME ACCOMPLISHMENTS TO DATE

1. PROGRAMMING SYSTEM FIRMLY ESTABLISHED THROUGHOUT THE DEPARTMENT OF DEFENSE.
2. USED BY THE SECRETARY OF DEFENSE AS PRINCIPAL MANAGEMENT TOOL FOR DECISION-MAKING.
3. USED BY THE SECRETARY OF DEFENSE IN ANNUAL BUDGET PRESENTATION TO CONGRESS AND WELL RECEIVED BY CONGRESS.
4. CONCEPTS OF MULTI-YEAR PLANNING AND PROGRAMMING ACCEPTED BY THE BUREAU OF THE BUDGET FOR GOVERNMENT WIDE APPLICATION.
5. ASSISTANCE ASKED FOR BY THE NATO COUNTRIES IN APPLYING THE PROGRAMMING SYSTEM TO THEIR OWN DEFENSE FORCES.
6. EFFECTIVE LINKS ESTABLISHED BETWEEN MILITARY PLANNING AND BUDGETING.
7. SERVICES LEARNING HOW TO USE THE PROGRAMMING SYSTEM FOR OWN MANAGEMENT PURPOSES.
8. DOCTRINE OF COST/EFFECTIVENESS ESTABLISHED IN DECISION-MAKING.
9. PROGRAMMING DATA HAS BEEN COMPUTERIZED.

CHART 26

