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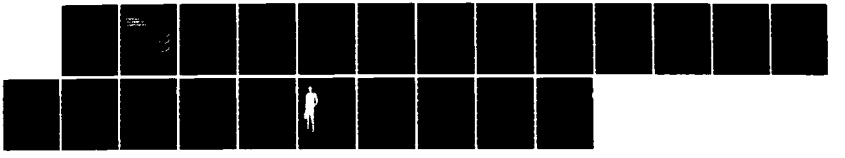

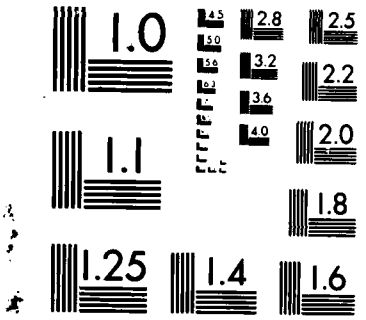

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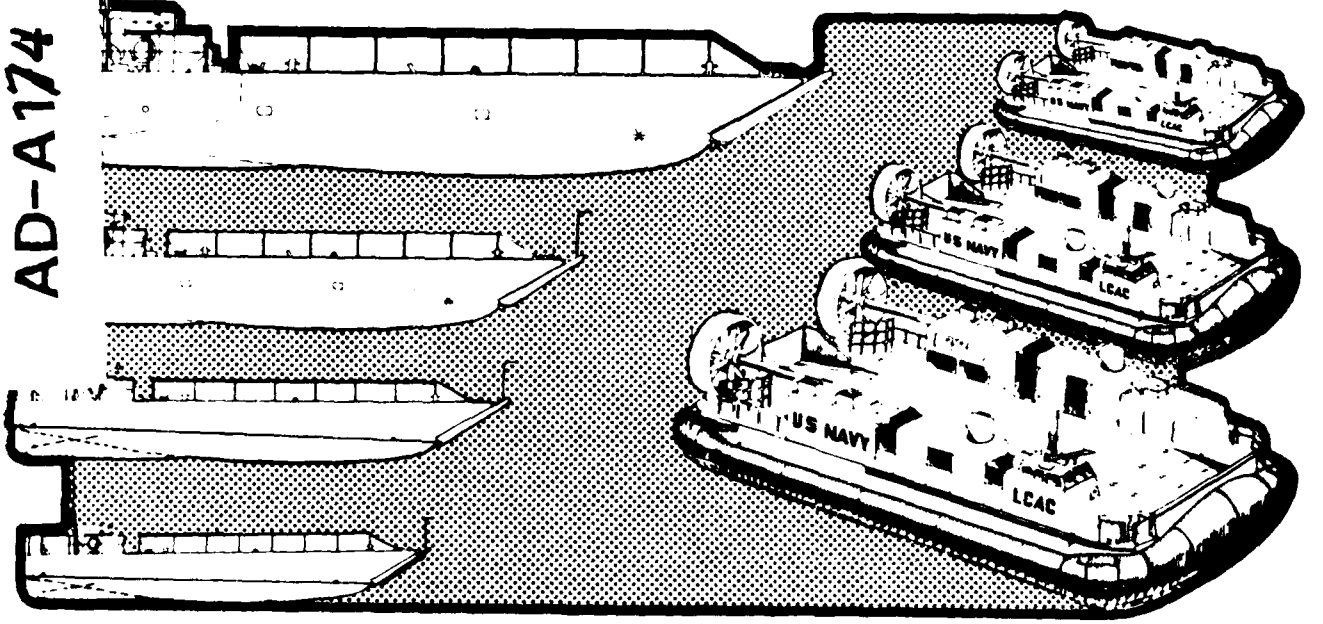

DEFENSE SYSTEM ACQUISITION: TACTICS FOR EFFICIENCY AND EFFECTIVENESS

by: J. Kallenberger

ASSOCIATION OF SCIENTISTS AND ENGINEERS OF THE NAVAL SEA SYSTEMS COMMAND • DEPARTMENT OF THE NAVY • WASHINGTON D.C. 20362

DEFENSE SYSTEMS ACQUISITION:

TACTICS FOR EFFICIENCY AND EFFECTIVENESS

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ABSTRACT

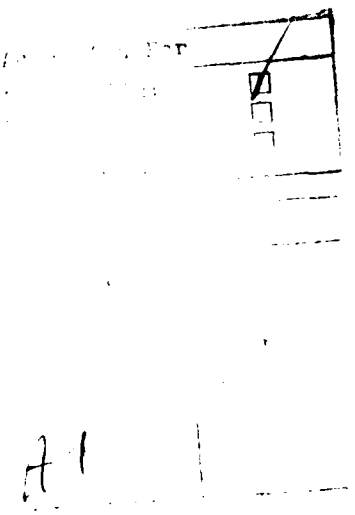
DEFENSE SYSTEMS ACQUISITION:

TACTICS FOR EFFICIENCY AND EFFECTIVENESS

With the increasing rate of change and the volatile resources of people, material, funds, and ideas, there is a growing concern among the populace on the issues of guns versus butter. What could the defense establishment do to increase its effectiveness, efficiency, and credibility?

The most underutilized resource is people. What are the upper limits of human potential? Some insight into this is provided by management. And yet, people not only do not know how to manage, often times they do not know what they are managing. Very few are aware and even fewer understand the management elements of program management: contractor finance, contracts, defense acquisition policy, effective communication, human resources, integrated logistic support, manufacturing, program cost, program funds, program decision briefing, systems engineering, and test and evaluation.

Innovative ideas and creative problem solutions are thwarted by the lack of a systems approach or orientation to the combat system by individuals at all levels. The result is a lack of action by ignorance and diminished planning lead-time for tasks and efforts. This paper, with program examples, examines the acquisition and life cycle management of combat systems, the cost and the impact to future ship construction.



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Abbreviations

AAW	Anti-Air Warfare
AP	Acquisition Plan
ASW	Anti-Submarine Warfare
DOD	Department of Defense
FYDP	Five Year Development Plan
ILS	Integrated Logistics Support
JMEM	Joint Munitions Effectiveness Manual
NAVAIRSYSCOM	Naval Air Systems Command
NAVSEASYSCOM	Naval Dea Systems Command
NIH	Not Invented Here
NOS	Naval Ordnance Station
NSWC	Naval Surface Weapons Center
OMB	Office of Management and Budget
OPN	Other Procurement Navy
OPNAV	Operational Naval
POM	Program Objectives Memorandum
PPBS	Planning, Programming ,and Budgeting
PRR	Production Readiness Review
SPD	Ship Project Directive
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan

1.0 Introduction

Fundamental processes and concepts of decision-making and management from the OSD level through the Service Headquarters to the program office include: organizational and management interfaces amd practices that are relevant to DOD acquisition management; Mission Area Analysis, the technology base, threat forecasting; the systems acquisition life cycle, NATO RSI, Foreign Military Sales; resource allocation and the Planning, Programming, Budgeting System (PPBS); the Congressional legislative process phase of the funding cycle and the impact of the external environmental issues and constraints on program management. Figure 1 shows the external influences on program management decision making.

In his statement before the Committee on the Budget to the United States Senate of March 3, 1980, Navy Secretary John Lehman said,

> "I am concerned that in career personnel, in weapons procurement and in naval shipbuilding, unless drastic action is taken now it will soon be beyond our maximum effort to recover. The effects of the downward spiral in these areas reinforce and accelarate each other...A shipyard closed, its work force dispersed, takes a decade of effort to revive. The past fifteen years have witnessed the dissipation of much capability and irreplaceable human resources. The fundamental tests of our defense establishment, to deter aggression and to prevail if deterrence fails, is now in doubt."

The four major steps in ship design are feasibility studies (concept and characteristics), preliminary design (the first cut at ship system), contract design (completed system design), and detailed design (production plans). Ship design is all of the engineering effort to design and keep the program alive.

Ship design is iterative in nature as shown by Figure 2. Due to the diversity and complexity of ship design, closeness of integration between the Ship Design and Engineering Directorate (SEA 05) and the Weapons and Combat Systems Directorate (SEA 06) is essential.

Changes to a ship design baseline result in another point of stability through tradeoffs--the next baseline. A ship that gets built is a result of compromise and keeping within the established design budgets. To do this, the elements of program management must be effectively utilized.

2.0 Program Management Elements

2.1 Fundamentals of Program Management

Program managers continue not only to plan, organize, staff, lead and control, but also they have to become integration competent. The program manager must provide unity of purpose and effort to achieve productivity and results in a timely manner from many diverse functional areas.

Productivity means more product per dollar, improved internal operations, more effective utilization of available resources, enhanced capability in the hands of the customer, and a resulting expanded sense of personal satisfaction and self-esteem. Responsible management and superior productivity are inseperable. Figure 3 shows some attributes of an effective program manager.

2.2 Defense Acquisition Policy Management

The rudiments of defense acquisition policy can be found in DODD 5000.1 (Major Systems Acquisition), DODD 5000.2 (Major Systems Acquisition Policy Process), and OMB circular A109 (Major Systems Acquisition). Collectively, these policies are concerned with agency mission needs, early direction of research and development, innovative private sector contributions, avoidance of premature commitments to full scale development and production, early communications with Congress, and an integrated systems approach.

2.3 Systems Engineering Management

Objectives of systems engineering management include a methodical approach to system development, trade-off techniques, a fully integrated system life cycle, compatability of all interfaces within the system, documenting major technical decisions, and systems effectiveness. A systems acquisition management overview is provided in Figure 4. Figure 5 shows typical technical management levels of effort throughout the acquisition life cycle. Each of these levels has an associated program cost.

2.4 Program Cost Management

This element is concerned with contractor pricing approaches, enconomic escalation factors, improvement (learning) curves, contractor performance measurement baseline, and Cost/Schedule Control Systems Criteria. Cost control works hand in hand with funds management.

2.5 Program Funds Management

The Federal and DOD resource allocation systems affect acquisition program management. Federal funds management is not designed for effective acquisition management, responds to its own logic, and has congressional imposed financial structures. The budget is a dynamic political document and as major changes occur, the budget is never settled.

Basic funds management requires an understanding of the Five Year Defense Program (FYDP), major forces program structure; the Planning Programming and Budgeting System (PPBS); the Program Objectives Memorandum (POM) process, and the authorization, appropriation, apportionment, and allocation of funds.

One of the many uses of program funds is the development and manufacturing of the system.

2.6 Manufacturing Management

Manufacturing management is the efficient use of resources to produce the required number of items within cost, on schedule and that meets the

performance requirements. For a smooth transition from development to manufacturing, planning early in the acquisition process is imperative. This planning includes a productibility analysis, production feasibility, production risk, mobilization capacity, use of the Defense Priorities System, procurements, prototypes, Production Readiness Review (PRR), design-to-cost, life cycle cost, preplanned production improvements, facilities, personnel, and demonstrating that the technology required meets the need.

2.7 Contracts Management

This element is concerned with the Acquisition Plan (AP) procurement regulations, the methods of contracting; the offer, acceptance, and consideration of the contract; the change, dispute, and termination clauses of a contract, and especially the type of contract (fixed price or cost plus) with applicable incentives. The degree of risk as a function of contract type is shown in Figure 6. It should be noted that a properly structured SEATASK can be an effective contract between headquarters and the Navy f eld activity.

2.8 Test and Evaluation

Test and Evaluation (T&E) is required to establish suitability for operational use and verify the system performance. The Test and Evaluation Master Plan (TEMP) is the primary document used by DOD in assessing the adequacy of the entire T&E program. For Navy programs guidance is provided in OPNAVINST 3960.10.

Resources required for T&E include test sites and ranges, targets, fleet support, special instrumentation and support equipment, expendables, logistic support, personnel, personnel training, and computer time and simulation support.

2.9 Contractor Financial Management

Profit planning and control is to a corporation what PPBS is to DOD. One of the report cards by which corporate management is evaluated is their financial statement. Examination of it gives insight into the firm's adaptibility to induced internal or external financial adversity. Some things to look for are current assets, fixed assets, liabilities, long term debts, turnover, and cashflow. The contractor's cost structure can increase the risk to the government.

2.10 Integrated Logistic Support

In war, the logistician is in demand; in peace, he sinks into obscurity. Integrated Logistic Support (ILS) is an iterative and unified approach to define the support requirements, design for the support, design the support, and ultimately to support the system design over the life cycle of the program. The various elements of ILS are

-supply support
-manpower and personnel
-support and test equipment

-technical data
-packaging, handling, storage, and transportation
-computer resources support
-facilities
-training and training devices
-the maintenance plan

The key resource behind effective ILS management is the human resource.

2.11 Human Resources Management

Management involves people. Most critical problems are not things but people. Our greatest failure has been our inability to cooperate with, and understand others.

Each of us is a leader and our styles vary with the situation. Typically, there are the telling, persuading, consulting, delegating, and joining styles. Each is a compromise between leader authority and group freedom.

The individual must understand techniques for improving the effectiveness of meetings, the managing of time, and personal values and behavior. This understanding is invaluable when one must give a program briefing that requires a decision.

2.12 Program Decision Briefing

In giving a briefing, one of the first things to do is to consider the audience. Other constraints include the individual information needs, the maximum time allotted for the briefing, required format, and likes and dislikes of the individual who is to be briefed. The alternatives should be clearly defined with the associated cost,schedule and risk to the program.

A simple briefing outline is

- agenda
- objectives
- background
- assumptions
- issues or problems
- alternatives
- cost,schedule,and technical performance
- recommendation

In communication, one's perception is normally tainted by experience. The message can be easily distorted, not because of the facts, but because of the way those facts are perceived. The maximum hearing rate is around five hundred words per minute, but the maximum speaking rate is only one hundred twenty-five words per minute. This means seventy-five percent of the time, the listener is preoccupied with other thoughts.

One must understand the feedback of the receiver and how to use it to your advantage to resolve acquisition concerns.

3.0 Acquisition Concerns

3.1 Systems Approach

We live in a world of increasing interdependence. If there is one fault common to all,it's the lack of a systems approach. A gun mount is useless if it does not have ammunition, and a fire control system. Yet too often the individuals who manage the fuze, projectile body, explosive, cartridge case,propellant, computer program, or gun mechanics, only think of their area and not of the interfaces or the system as a whole. Parochial minded thinking is narrow minded thinking.

The Naval Ordnance Station(NOS) Indian Head, is one of the Navy's gun propellant field activities. Let's consider the effects of a cooler burning and higher energy propellant. There is an increase in range and barrel life. New range tables and fire control functions must be generated because of the new ballistic trajectory. Also,there is a change in magazine load out(ship fill)-MK 1 round and now the MK 2(increased range) round. Is there an R&D budget line to support the development or does the OPNAV sponsor want to fund this effort as an OPN product improvement?

Another field activity, the Naval Surface Weapons Center (NSWC) at White Oak has an improved fuze. Target miss distance has decreased, kill probability has increased. The round is more effective. The Joint Munitions Effectiveness Manual(JMEM) has now been impacted. A T&E and qualification program will have to be done. It should be noted that the Army is the Single Service Manager for conventional ammunition.

This fuze design is the result of the joint effort between the Naval Weapons Center at China Lake and NSWC. Now, there are two Systems Commands involved; one is NAVAIRSYSCOM and the other is NAVSEASYSCOM. Required coordinated management effort has now increased. Changes to the Technical Data Package becomes more difficult.

The OPNAV sponsor now has a decision to make. Should the fuze and propellant technology programs be done concurrently? This would result in a MK 2 Mod 1 round rather than a MK 3 round(fuze improvement only).The situation could be further complicated if the selection of a foreign gun mount were made. An example of this would be the MK 75, an Italian designed gun system.

Similarly, a guided missile has a seeker, guidance and contol,fins,warhead, safe and arm device, rocket motor, igniter,launcher,and weapon fire control. It is fired from aircraft, ship, submarine or land vehicle.

The HARPOON missile is encapsulated for launch from torpedo tubes. It requires a booster rocket motor to provide the necessary thrust and corresponding velocity. Launched from a surface ship, the booster rocket motor is also required. However, when the missile is launched from an aircraft, the booster rocket motor is not necessary. Continued flight is provided by a sustainer engine. A design change to the rocket motor would be of interest, but not a primary concern to either the Air Force or NAVAIRSYSCOM.

A weapon system or combat system can be used by more than one service or country. While defense and foreign policy may differ, the tactics and use of the systems may differ; and the language, technology base, and form of government

may differ; the underlying consistency of nations is that it is the human element that makes decisions.

3.2 Information Flow and Decision Making

Many individuals are infected by the NIH (not invented here) syndrome,have burned out and as such are dead wood, or are job insecure(a black hole of information).

Those who assess their predecessor's watch, and prepare their successor, generally succeed, are promoted, are ambitious but are not glory hunters for achievement and accomplishments of the organization, instill a sense of loyalty, and foster a forum for trust and communication with their subordinates,peers,and superiors. Those same individuals think of themselves in a global context, are able to advocate program cancellation when necessary,know how to plan, and are willing to take risk.

Short term planning is short-sighted planning. Lack of a program plan and tasking prevents identification of cost growth and control. The weakest link in the team is the uninformed. Always consider distribution and codes on correspondence. Inadvertently, there will always be someone who does not receive the written or verbal notification of a subject that falls under his or her cognizance, or is an information item of interest. Communication between activities or agencies and even individuals and colleagues within the same branch does not take place.

The mentality of not invented here, job insecurity, personalities,and grade level differential will frequently invade the realms of common sense. Innovative ideas and creative problem solutions are thwarted by lack of a systems approach or orientation to the weapons,combat or ship system by individuals at all levels. The result is inaction by ignorance and diminished planning lead time for tasks and efforts.

3.3 SEATASKS and Cost Control

The cost control between the government and private industry is determined by the terms and structure of the contract. However, NAVSEASYSCOM could have similar cost control with Navy field activities, if the tasking document(SEATASK) were properly planned and defined.

The abscence of tasking or the scoping of more than one weapon system under the same tasking prevents identification of cost elements, encourages funds shifting among programs, promotes slippage of milestones, and results in non-justifiable cost growth. Simplistically,the tasking document should provide a background and scope of work,an implementation plan, a milestone chart, and planned expenditure rate for each year and appropriation type.

The description of work should cite technical objectives,background, existing situation,plan of action, and delivery schedule. Funding for this task is currently provided under (cite each funding document specificly) with work efforts being completed at appropriate defined times. Implementation plans, milestone charts,and expenditure rates are provided as enclosures (1),(2),and (3) respectively. It should be noted that required but unfunded efforts are also provided for planning purposes. Fiscal provisions for these unfunded efforts is under advisement by (program office code). No work is authorized prior to receipt of the corresponding funding document.

The approach that is taken, is that each individual would be given the

opportunity to be an "honest" person in order to build the necessary management team and trust necessary for the survival of the program. Techniques are very carefully selected so that all parties would accept the philosophy of the NAVSEA program manager. Eventually, people will volunteer problem areas, cost information,and find new ways of doing old things in less time.Each participating activity receives a SEATASK structured with input from the activity and "tailoring" for cost control, fiscal drills, and ready update of the FYDP.

A quarterly report in narrative form shall be provided to (program office code) ten days after the quarter with copy to (applicable codes). Include your directorate financial code on distribution. It shall reflect expenditures and major acquisition/ manufacturing product improvement summaries,and shall separate engineering from production/acquisition services. The report shall include a narrative,updated SEATASK Enclosures (2) (3) and (4), and one page appropriation summaries (i.e. funding document numbers and respective amounts budgeted and expended. With a copy of this being sent to the financial side of the house, you have identified projected cost overruns. If another program can not obligate its funds you have identified a program that can.

Enclosure (4) shall be provided for purposes of tracking life cycle costs. The enclosure can be defined with categories and elements applicable to the system. It can be used for cost projections and budget formulations.

At least one other item should be included in the task document, a simple one page form that could be submitted anytime from anyone to the program director. The outline is as follows:

Name
Agency
Phone

Date

Title of Program

Issue/Concern/Problem
Situation and Background
Alternatives
Cost/Schedule
Recommendation

An individual should not take the approach of "I've got a problem, what should I do to solve it?" Rather, "There is a problem, these are the ways to solve it, this is what it will cost, it will take this long, and I recommend Alternative X. What is your decision?"

Contractual authority,source and disposition of materials, and security requirements should also be specified in the SEATASK.

3.4 Shipbuilding and Program Funds

Recall the iterative nature of ship design as shown in Figure 2. Guns and missiles were mentioned earlier as part of the AAW system. One of the other warfare areas is ASW.

The AEGIS Shipbuilding Project is managed by PMS400. In the feasibility

step of ship design, cost estimates were requested.Part of these estimates are based on previous life cycle cost information for similar systems. The Form 7300 identifies specific items such as major hardware,government provided components, ancilliary equipment, technical data and documentation, spares, systems engineering, technical engineering services and other costs.

This cost estimate is translated into a budget called the Ship Project Directive(SPD). The SPD consists of line items similar to that found on the Form 7300. There are three parts to the SPD. The first provides guidance and direction, the second the budget, and the delivery schedule is provided in part three.

The AN/SQQ-89(V) ASW system is to be installed on the DDG 51 and CG 47 class ships. It consists of a hull mounted sonar (AN/SQS-53), TACTAS (AN/SQR-19), LAMPS (AN/SQQ-28), and ASW Control System (MK 116).

Specifically, the MK 116 Mod 7 SPD is document N0002485PD4D514. The first program shortfall occurs because the directed planned amount shown is less than the cost estimate. The second funding shortfall occurs because the directed current amount(the program bank account for each line item) is less than the directed planned amount. For example, the Form 7300 shows $373,000 for technical data, line item 101C of the SPD for Technical Documentation shows $273,000 for the directed planned amount, and only $91,000 for the directed current amount.

Additional funding by the Shipbuilding Project manager can be authorized depending upon the individual program offices' need,funds obligation track record and Congressionally imposed budget cuts. After the ship is built and equipment installed, it is imperative that each program office have a budget line for the life cycle of the system.

4.0 Conclusions and Recommendations

The concerns and examples cited above provide some insight into the acquisition and life cycle management of combat systems, the cost, and impact to future ship construction. In conclusion, the individual is not making as positive an impact on ship building as he could and must if the defense establishment is to increase its effectiveness, efficiency, and credibility. It is recommended that each person be more aware of the acquisition system, the processes by which it works, people involved, planning, and sources of funds.

References

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3. Graham, Clark, "The Operator and Engineer-Partners in Naval Ship Design" Naval Engineers Journal, June 1973.

4. Toward Effective Program Management, Defense Systems Management College, Fort Belvoir, July 1982.

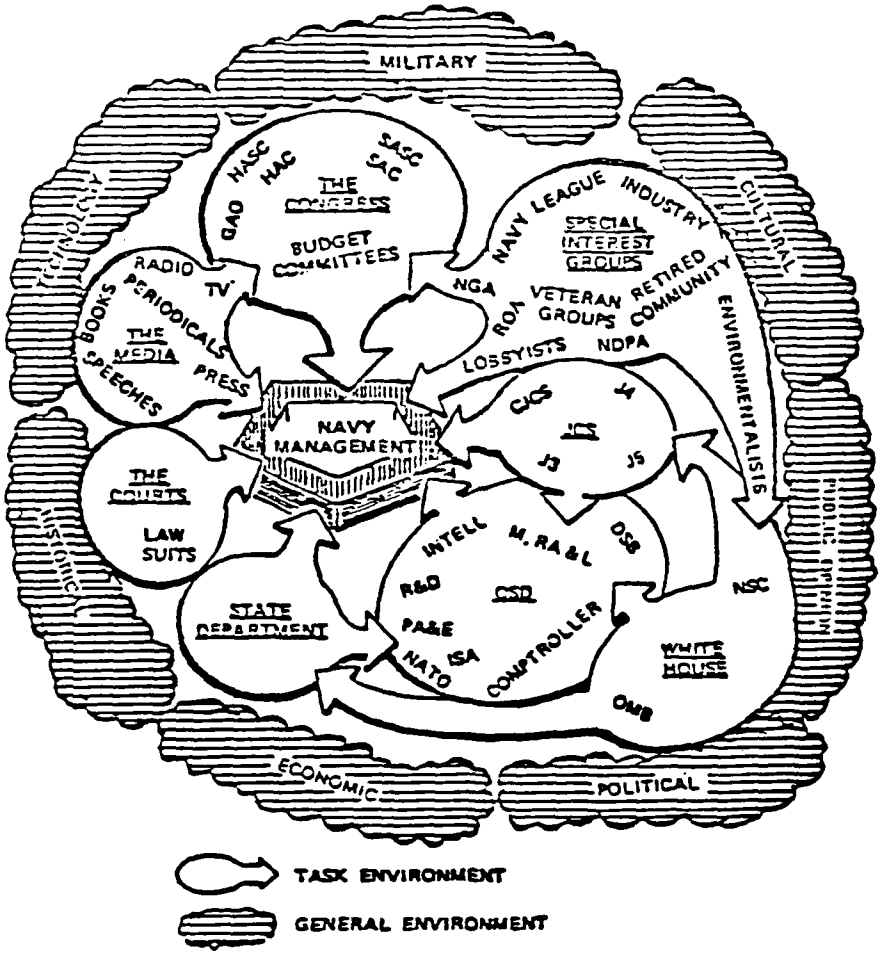

Figure 1 External Influences on Program Management Decision

Source: Navy Program Managers Guide,Headquarters,Naval Material Command,1-18,July 1983

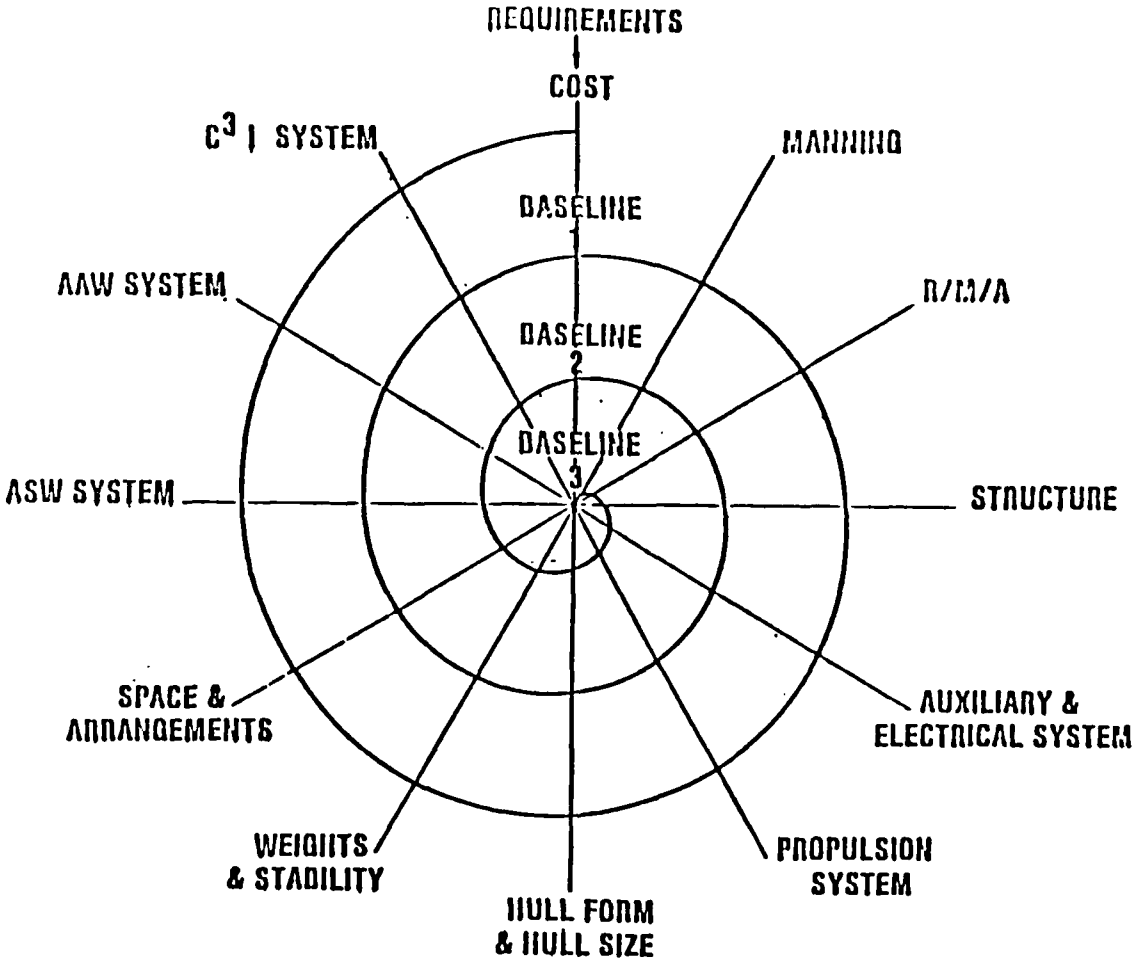

Figure 2 The Iterative Nature of Ship Design

Figure 3 Attributes of an Effective Program Manager

Source: Toward Effective Program Management, Defense Systems Management College, Fort Belvoir, July 1982

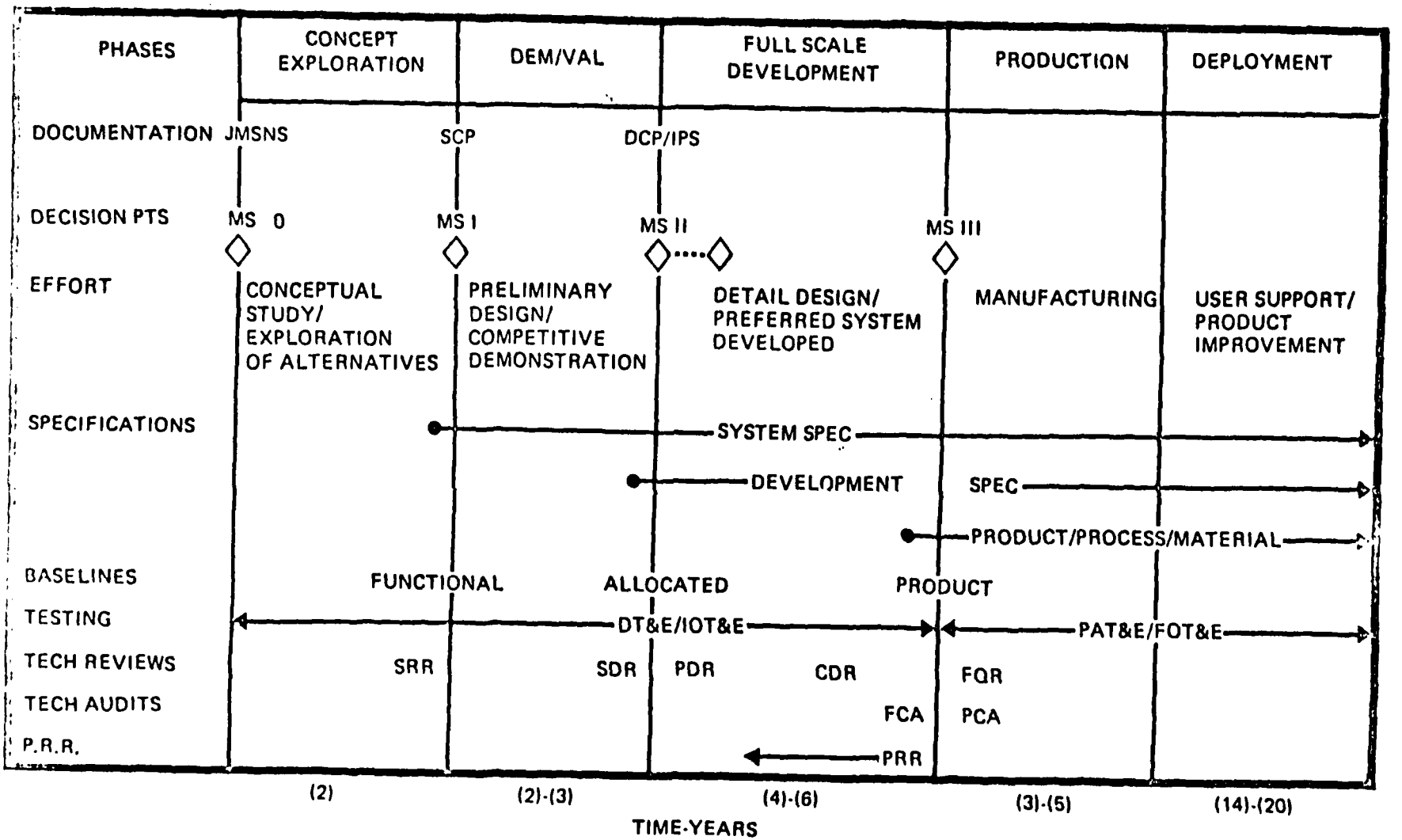

Figure 4 Systems Engineering Management

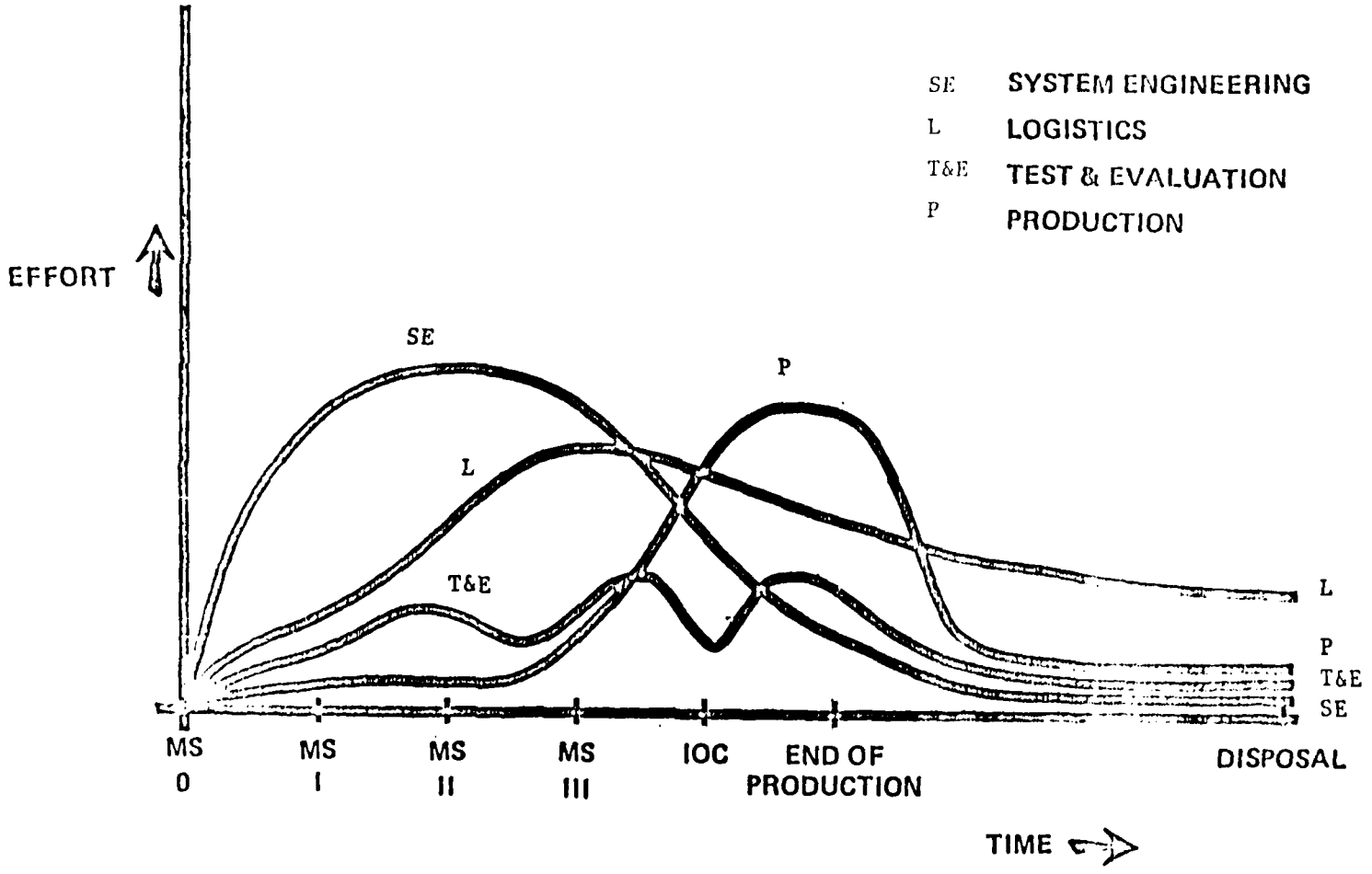

Figure 5 Technical Management Levels of Effort

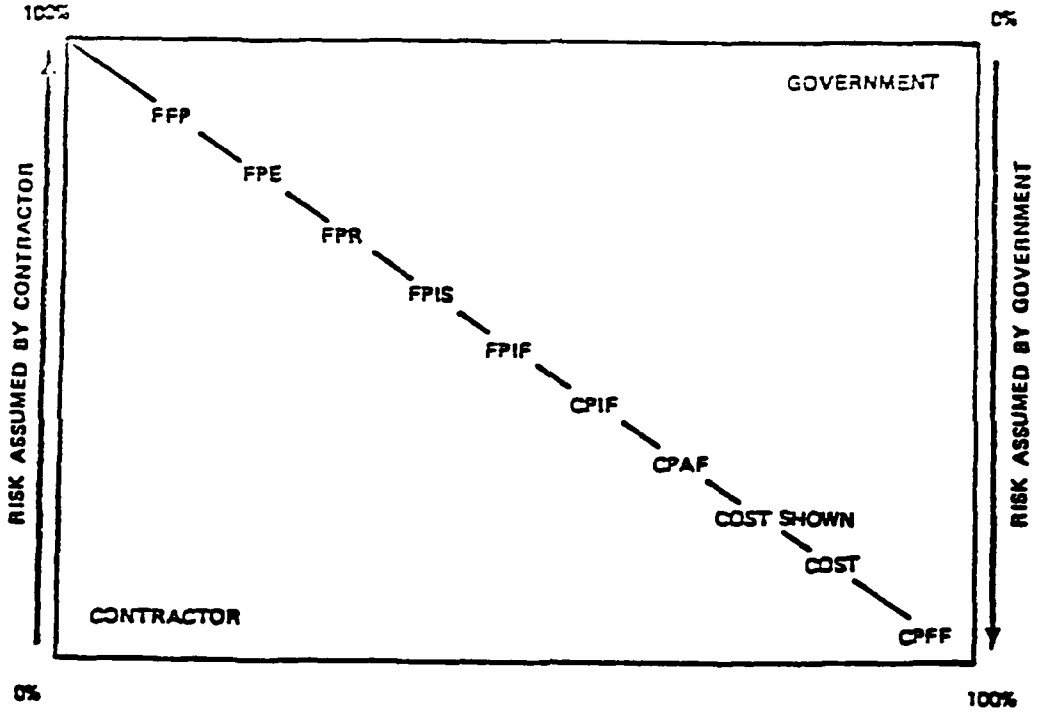

Figure 6 Degree of Risk as a Function of Contract Type

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