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STATEMENT OF  
ELMER B. STAATS  
COMPTROLLER GENERAL OF THE UNITED STATES  
BEFORE THE  
COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES  
ON  
COST GROWTH IN MAJOR WEAPON SYSTEMS

Mr. Chairman and Members of the Committee:

We appear this morning at your request to discuss our report, "Cost Growth in Major Weapon Systems", which was prepared in response to your request of June 21, 1972.

For 4 years we have been providing the Armed Services and the Appropriations Committees with (1) staff studies on specific weapon programs and (2) annual evaluations of the overall process of weapons acquisition so that they will have reliable information to carry out oversight and legislative duties. We share the deep concern of the Congress with the problem of the escalating cost of weapons.

In the summer of 1969 we advised you that we were establishing a special group in our Defense Division to deal with major weapon system acquisition problems. About a year ago, we established a separate division to better coordinate all our procurement and systems acquisition work. To date, most of our reviews have been on weapon systems, but we are beginning to cover civil systems as well.

We have also been broadening the base of our competence by selectively acquiring a wide range of disciplines in our technical staff.

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We are, of course, proud of our staff capabilities, but we are finding it useful to engage outside experts for advice on overall approaches and, to occasionally assist our staff in evaluating the technical aspects of particularly complex systems. This has substantially increased our competence in dealing with both acquisition policies and specific weapon systems.

Today, we will summarize our views on weapons cost growth and closely related problems. The points we will discuss and recommendations we will make are not novel nor are they cure-alls.

Many other groups and experts have studied weapons procurement. In our study we have analyzed the observations, perspectives, and recommendations of others who, like ourselves, are concerned about the disturbing trends in weapon system cost, including those participating in and managing the weapon acquisition process. Our findings and recommendations, therefore, are based on a broad consensus and make good sense to us.

#### PRINCIPAL ELEMENTS OF THE GAO REPORT

Probably no segment of the Defense budget has received more attention during the past several years than the growth in cost of new weapons or weapons systems, caused principally by

- increased performance demanded of new systems which, in turn, require greater complexity, and
- increases resulting from the way a weapon program is managed during development, design, and production.

The military services continually demand performance and capabilities of new systems significantly more advanced than those to be replaced--to meet new or potential threats and to exploit new technology.

Efforts to monitor these weapon acquisition programs in detail; to achieve often elusive and distant cost, schedule, and performance objectives; and to control various kinds of changes have resulted in much debate and many studies within and outside the Defense Department.

Our report includes what we believe to be key observations and conclusions of recent studies made by such groups as the:

- Blue Ribbon Defense Panel
- National Security Industrial Association
- RAND Corporation
- Department of Defense
- Commission on Government Procurement
- General Accounting Office

A summary of their key ideas is attached as an appendix to this statement.

Although no data is available to measure the causes of cost growth precisely, it is generally agreed that the greatest single factor in cost growth stems from continuously expanding performance requirements.

Cost Growth Resulting from Greater  
Capability Being Demanded of  
Replacement Systems

Most resources are invested in systems to supersede existing ones. Successive generations of systems following this pattern crowd state-of-the-art frontiers and, of course, costs increase with each increment of improvement. This technological escalation can be expected to drive costs up, no matter how well the programs are managed.

The Navy S-3A antisubmarine aircraft, the Air Force F-15 fighter and B-1 bomber, as examples, will cost many times more than the systems they are to replace. These increases might be described as performance cost growth--the tendency to continually seek higher performance systems--one of the most serious aspects of cost growth because, under fixed budgets, tradeoffs for more complex and more costly systems means fewer systems.

Later, you will see a graph comparing cost and performance changes in 13 new weapon systems with systems they replace. Performance is estimated to be two to three times greater for the new systems. For those increases, R&D costs went up five times and production unit costs four times. These performance gains, i.e., higher speed, greater range, and improved payload, must be looked at as interim gauges--the ultimate measure of weapon effectiveness is success in combat.

The process of justifying a new weapon system must not only compare the performance improvements of the new weapon over the old but also must consider such factors as reliability and effect on readiness, crew training and motivation, support from associated systems, tactics, and doctrine.

#### Cost Growth Due to Acquisition Management (Overruns)

Histories of 45 systems under development at June 30, 1972, show that current cost estimates to acquire the systems increased by some \$31.5 billion, or 39 percent, over planning estimates and \$19.1 billion, or 20 percent, over development estimates. These widely publicized overruns have shaken public confidence in the ability and credibility of both Government and industry managements. In the case of the highly publicized C-5A, the estimated cost per plane doubled in a 5-year period.

An analysis of the cost changes reported by DOD in these 45 systems shows at least three different reasons for the cost growth.

1. Inaccuracy in estimating--DOD records show that cost-estimating changes accounted for about 25 percent, not 100 percent as many people are prone to assume.
2. Inflation--accounts for about 30 percent. DOD has furnished you with a report on the effects of inflation, and we won't duplicate this report.
3. Revisions to specifications, i.e., time schedules, quantities, or engineering changes--account for some 45 percent. Again, much of this type of cost growth results from unrealistic performance targets at the outset; including:

--Trying to do too much--challenging the outer reaches of the state-of-the-art, and

--Trying to develop and produce the system too rapidly.

Overly ambitious performance requirements; combined with low initial cost predictions, optimistic-risk estimates, and quick deployment; lead almost inevitably to engineering changes, schedule slippages, and cost increases. To keep total program cost from rising, planned quantities are reduced which, in turn, increases unit cost.

Yet another point to consider is the general consensus that production capacity, particularly in the aerospace and shipbuilding industries, exceeds current and reasonably foreseeable military needs. In those industries, a contractor obtaining one of the scarce development contracts can mean the difference between its staying in the business or not.

This pressures competing contractors to propose optimistically low prices, promise new and attractive system capabilities, and emphasize sophistication.

The cost overrun story is not peculiar to weapon systems. Civilian systems, such as nuclear power plants, Government buildings, and mass-transit systems, also have these problems and for many of the same reasons.

#### REFORMS TO EMPHASIZE

The past 4 years have seen vigorous activity to moderate weapon acquisition problems and to initiate new policies and management techniques.

The various actions proposed and being implemented are aimed at three key objectives.

- Making the right decision at the outset of what to develop and for what purpose.
- Avoiding the pitfalls in development and production that cause slippages and cost overruns.
- Strengthening the overall management of the systems acquisition process.

In 1969 DOD, under the guidance of Deputy Secretary Packard, began a series of comprehensive changes to weapon acquisition policies, seeking such things as (1) greater reliance on hardware demonstration and less reliance on paper studies, (2) wider use of cost-reimbursement contracts for development, (3) separation of development from production, and (4) improved cost estimating. These changes, taken together, were incorporated in DOD Directive 5000.1.

Another policy change, embodied in proposed Directive 5000.2, would involve the Secretary of Defense earlier in the decision cycle by requiring OSD-Service agreement on operational need and affordable cost and require more thorough analyses and evaluations of alternative systems.

These changes have found widespread support from the study groups mentioned earlier. The DOD Blue Ribbon Panel of 1970 and the Commission on Government Procurement have both urged that the Secretary of Defense participate in earlier decisionmaking on new weapons, as would be proposed by Directive 5000.2.

Through looking back over 4 years of our own efforts, and evaluating the views of prominent study groups and experts, we have compiled a list of 13 interrelated reforms which we believe deserve particular emphasis. These are discussed in our report and summarized below.

1. Obtain OSD, Service, and Congressional agreement on the basic operational need, the fundamental weapon system characteristics, and the expected level of resources to be allocated to that need.
2. Strengthen the staff support to provide the Secretary of Defense with comprehensive and objective analyses of missions and weapons requirements.
3. Extend the span of congressional authorizations--at least for 1 year in advance of the upcoming budget year.
4. Strengthen congressional reviews of weapon budgets by first considering and approving budget totals for major missions. This review will consider the overall needs of the various military missions.

5. Avoid concurrent development and production, and adhere to orderly and sequential design, test, and evaluation.
6. Stress austerity, small design teams, freedom to innovate, and maximum competition in the design phase, with clear separation of development and production. Encourage continuous development of subsystems.
7. Adopt contracting practices and Government/contractor relationships which will encourage the most effective team performance.
8. Continue to improve the Government's capability to develop cost estimates covering the development phase and the production phase of new systems.
9. Emphasize life-cycle costing to gain better perspective on proposed new systems and to strengthen cost-effectiveness analyses.
10. Continue the current strong emphasis on upgrading the competence , stature, and tenure of program managers and procurement specialists.
11. Continue to emphasize operational test and evaluation by establishing in each military department an organization independent of the developer and the user. The senior OSD official in this activity should report to the Secretary of Defense or to his deputy.



12. One of the two Deputy Secretaries of Defense should assume the responsibility for mission analysis and systems acquisition.
13. Improve the planning for maintaining the development and production base.

In this brief statement we have highlighted some of the more salient causes of cost growth in weapon systems and proposed suggestions, developed in our work and by various authorities.

We would now like to present a visual review of our report. A set of the charts which we will use is attached to this statement.

We are also attaching excerpts from some of the more prominent studies and informed comments on weapon system acquisition problems.

BRIEFING CHARTS

- 1 - COST GROWTH IN MAJOR WEAPON SYSTEMS
- 2 - TIMELINESS OF THIS SUBJECT
- 3 - RECENT MAJOR STUDIES
- 4 - THE DEVELOPMENT PROCESS FOR A MAJOR WEAPON SYSTEM
- 5 - THE PATTERN OF DEEPER INVOLVEMENT AND DECREASING OPTIONS
- 6 - TWO MAJOR CAUSES OF COST GROWTH
- 7 - THE RISING SYSTEM COST
- 8 - THE TANK STORY
- 9 - BECAUSE OF INCREASING COSTS FORCE LEVELS HAVE BEEN REDUCED
- 10 - AVERAGE INCREASE IN COST & PERFORMANCE
- 11 - COST GROWTH IMPLICATIONS
- 12 - THE SECOND CAUSE OF COST GROWTH IS MANAGEMENT AND TIMING FACTORS
- 13 - COST OVERRUN HISTORIES OF 45 WEAPON SYSTEMS
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- 25 - STRENGTHEN THE MANAGEMENT OF THE  
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- 26 - (ILLUSTRATIVE CHART - GAO'S CONCEPT)  
DEPUTY SECRETARY OF DEFENSE FOR  
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- 27 - SUGGESTED NEXT STEPS FOR THE RESPONSIBLE  
COMMITTEES

# **COST GROWTH IN MAJOR WEAPON SYSTEMS**

**REPORT OF THE COMPTROLLER GENERAL**

**MARCH 1973**

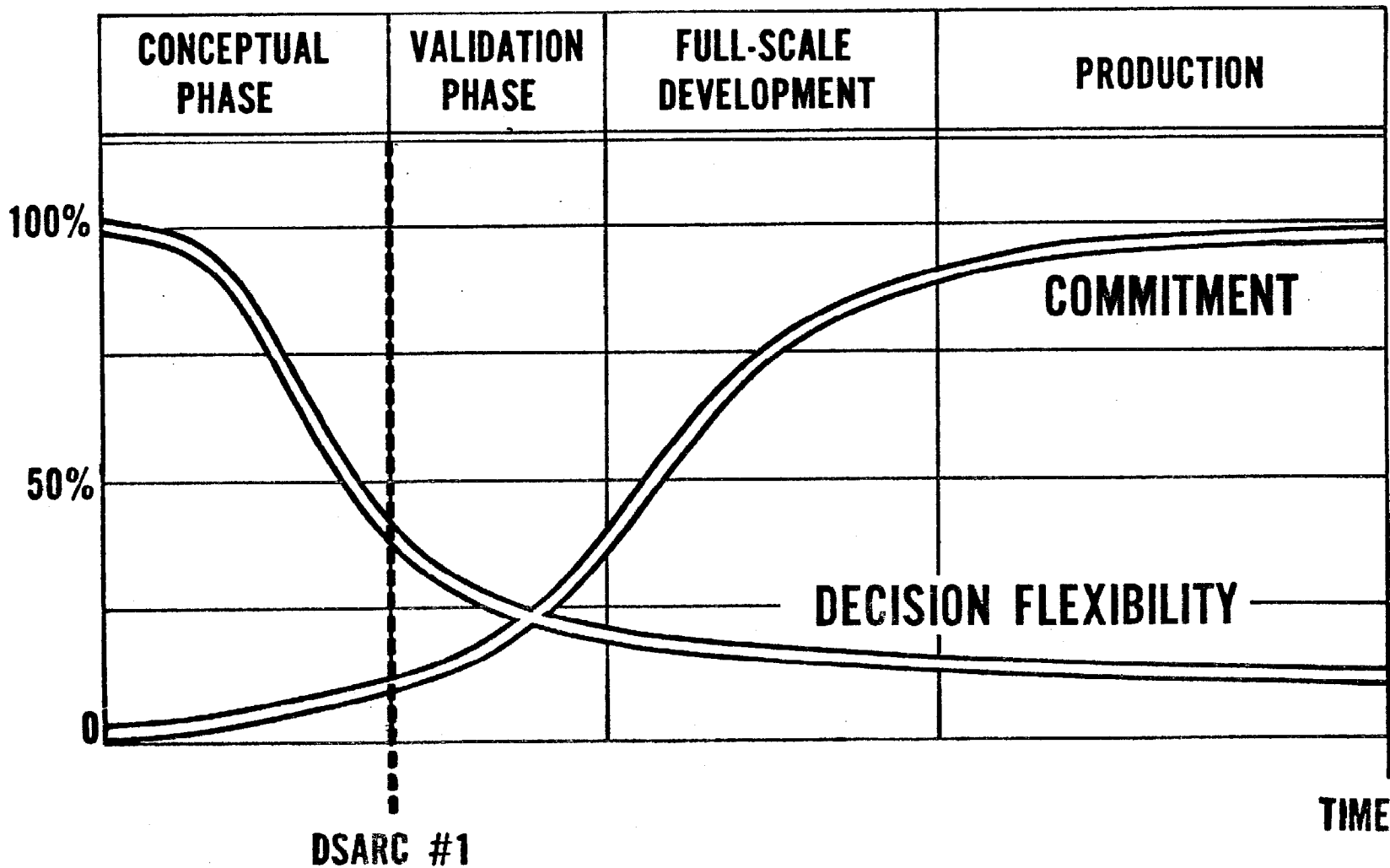
**TIMELINESS OF THIS SUBJECT**

**1 -- 116 MAJOR SYSTEMS BEING DEVELOPED**

**2 -- TOTAL COST WILL BE \$153 BILLION**

**3 -- OVER HALF YET TO BE APPROPRIATED**

# THE PATTERN OF DEEPER INVOLVEMENT AND DECREASING OPTIONS

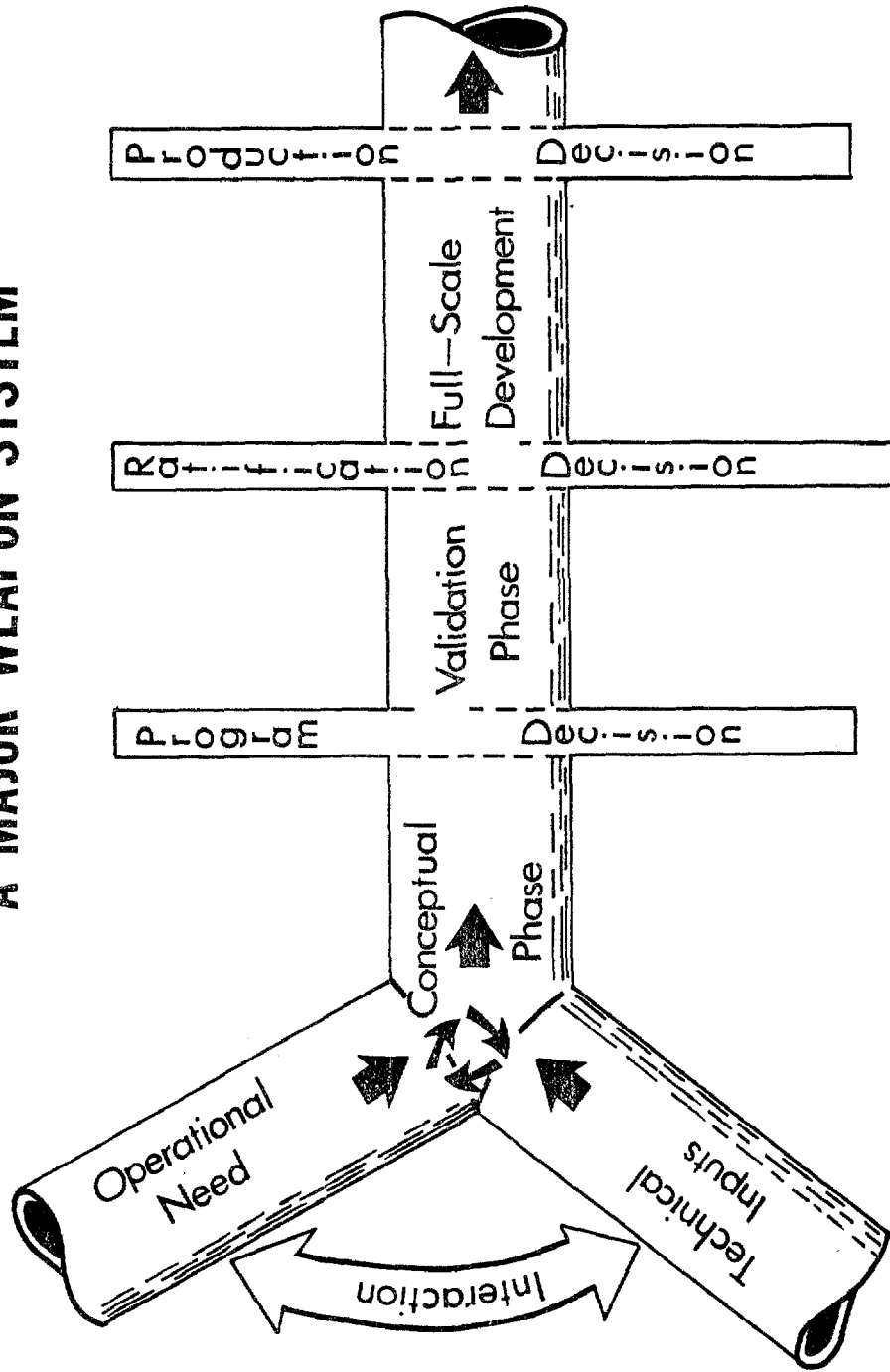


## **RECENT MAJOR STUDIES**

- **BLUE RIBBON DEFENSE PANEL**
- **NATIONAL SECURITY INDUSTRIAL ASSOCIATION**
- **CONGRESSIONAL HEARINGS AND REPORTS**
- **RAND CORPORATION**
- **DOD, ESPECIALLY SECRETARY PACKARD**
- **COMMISSION ON GOVERNMENT PROCUREMENT**
- **GENERAL ACCOUNTING OFFICE**

**A VERY BROAD CONSENSUS NOW EXISTS AS TO CAUSES AND SOLUTIONS TO PROBLEMS OF COST GROWTH**

# THE DEVELOPMENT PROCESS FOR A MAJOR WEAPON SYSTEM





## **TWO MAJOR CAUSES OF COST GROWTH**

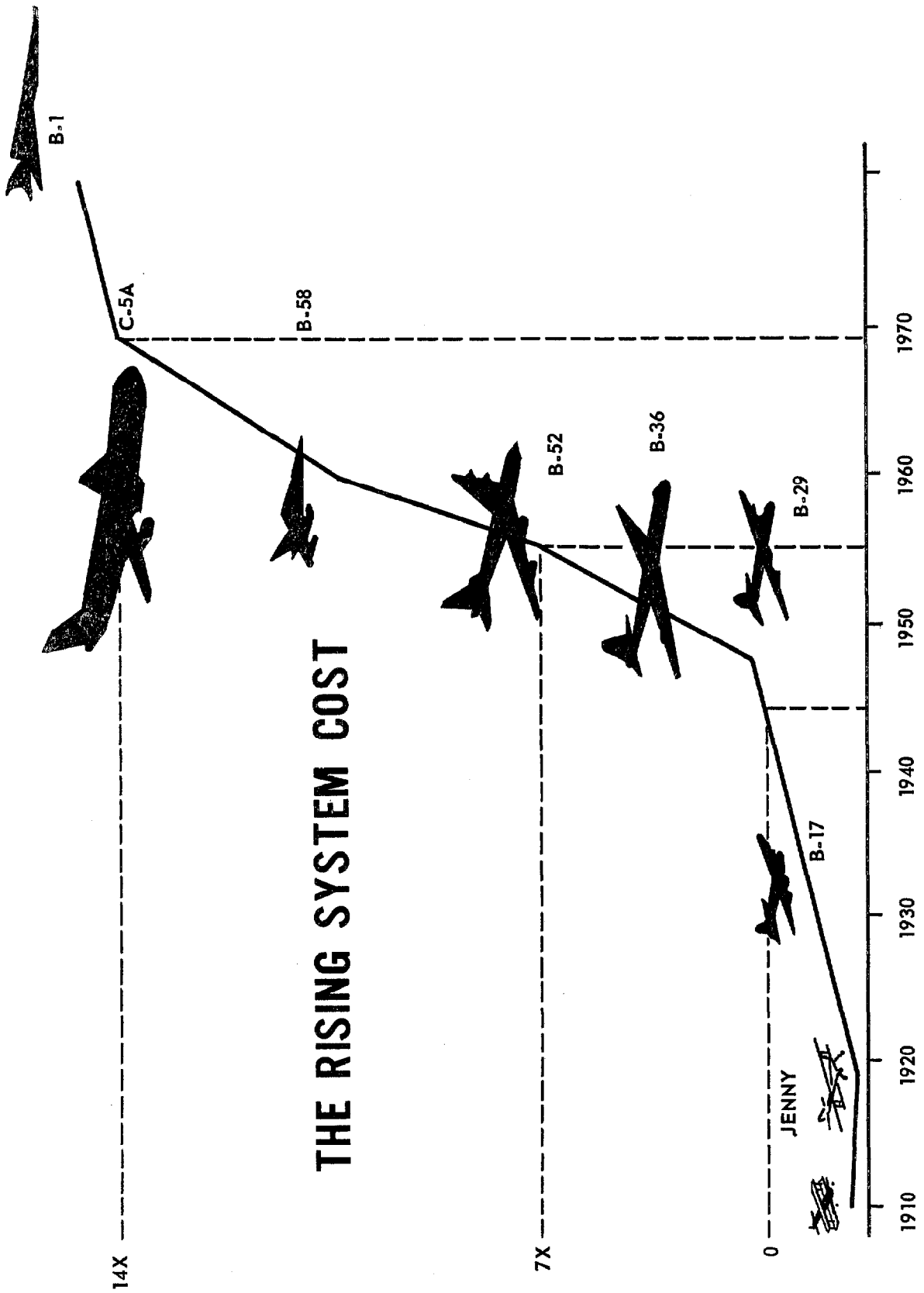
### **FIRST — INCREASED COMPLEXITY OF SYSTEMS**

- **GREATER CAPABILITY BEING DEMANDED**  
**RESULTS IN MARKED INCREASE IN UNIT**  
**COST FROM ONE GENERATION TO THE NEXT**

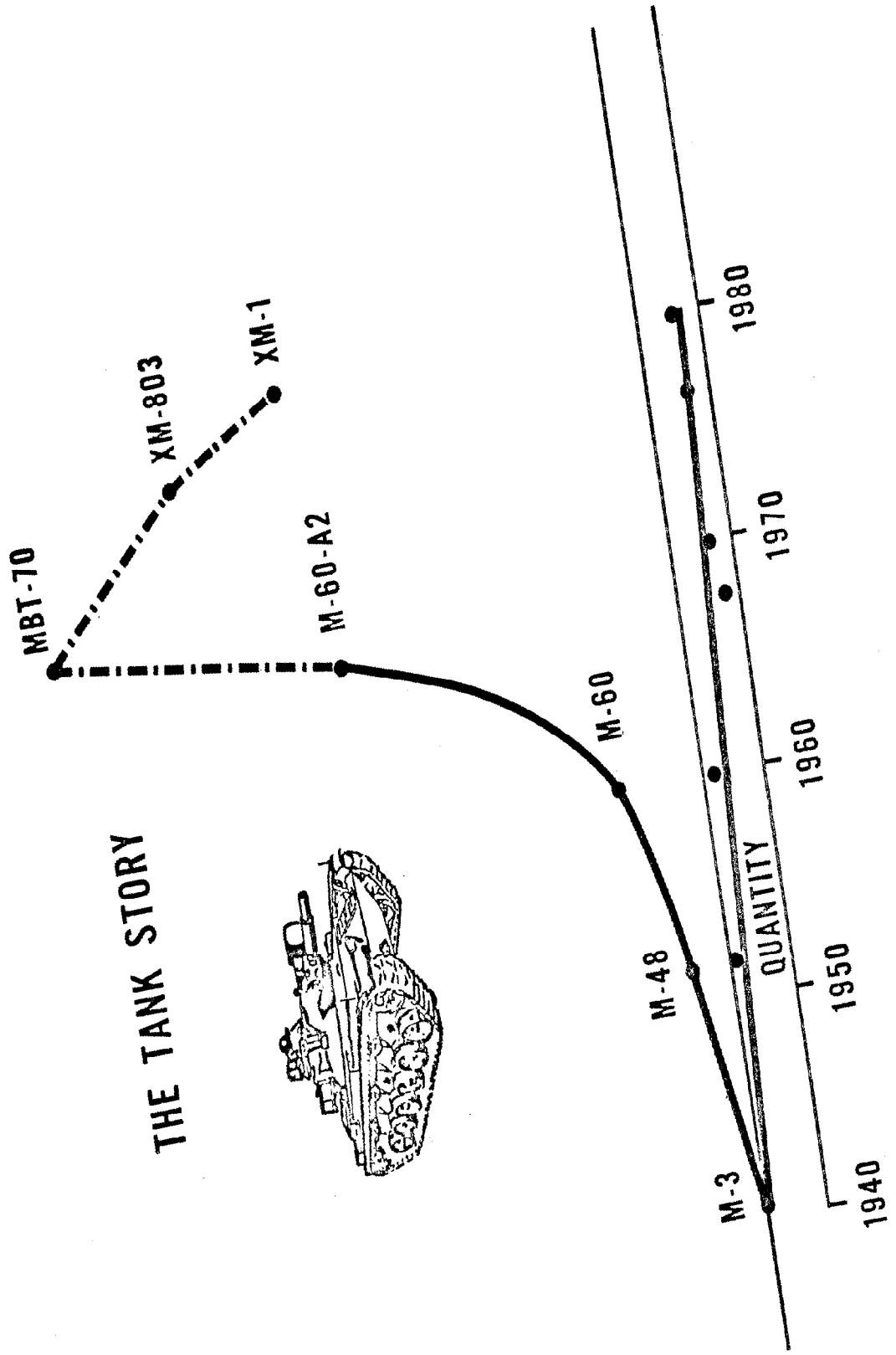
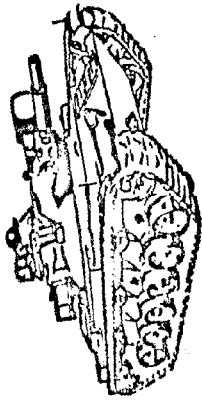
### **SECOND — MANAGEMENT AND TIMING FACTORS**

- **INFLATION**
- **ESTIMATING ERRORS**
- **CHANGES IN REQUIREMENTS**

# THE RISING SYSTEM COST



# THE TANK STORY



## BECAUSE OF INCREASING COSTS FORCE LEVELS HAVE BEEN REDUCED

SYSTEM	QUANTITY		UNIT COST		TOTAL COST	
	ORIGINAL	NOW	ORIGINAL	NOW	ORIGINAL	NOW
			(\$MILLIONS)		(\$MILLIONS)	
LHA	9	5	\$153.0	\$194.0	\$1,380.3	\$970.0
C-5A	120	81	28.6	56.0	3,423.0	4,526.0
F-14	710	313(?)	8.7	16.8	6,166.0	5,272.0
F-111	1,388	466	3.4	15.0	4,686.0	6,994.0

OTHER PROGRAMS, FOR EXAMPLE THE MBT-70 TANK HAVE BEEN CANCELLED BECAUSE THEY WERE TOO EXPENSIVE.

## AVERAGE INCREASE IN COST & PERFORMANCE

COST		PERFORMANCE													
R&D COST	5.4X	UNIT COST	4.2X	PAYLOAD	2.3X	RANGE OR ENDURANCE	1.9X	SPEED	1.8X	AVIONICS FUNCTION	3.0X	CREW COMFORT OR SAFETY	3.0X	DELIVERY OR NAVIGATION ACCURACY	3.0X

THIS AVERAGE BASED ON 13 MAJOR SETS OF NEW AND OLD SYSTEMS (SOURCE: ODDR&E)

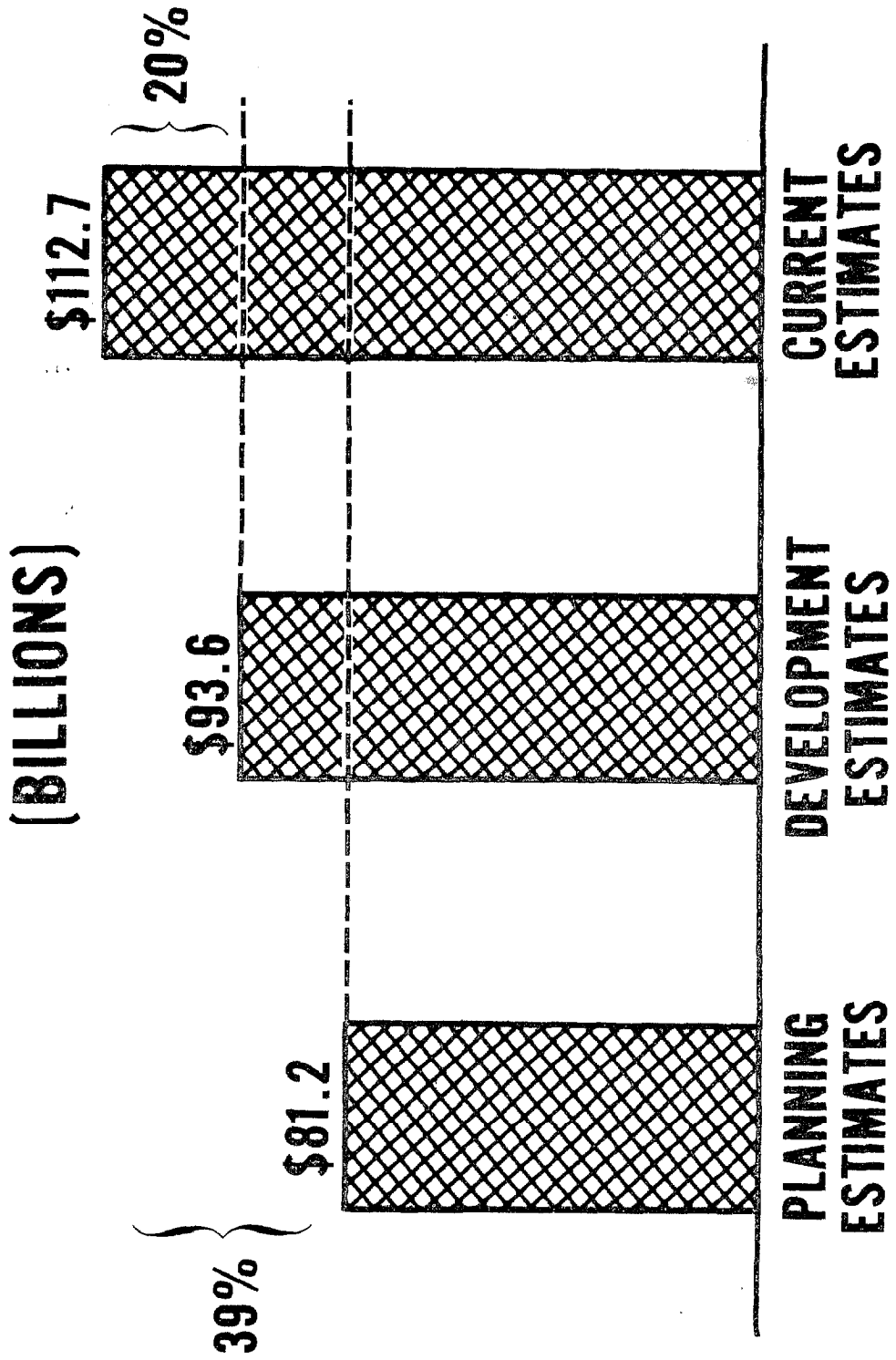
## **COST GROWTH IMPLICATIONS**

- **IF SIGNIFICANT UNANTICIPATED INCREASES CONTINUE THEN, DOD WILL BE FORCED**
  - **EITHER TO REDUCE FORCES BELOW PLANNED LEVELS**
  - **OR, TO SACRIFICE DESIRED PERFORMANCE**
- **FURTHER LOSS IN CONGRESSIONAL AND PUBLIC CONFIDENCE WILL OCCUR**

**THE SECOND CAUSE OF  
COST GROWTH IS  
MANAGEMENT AND TIMING FACTORS**

**THESE ARE THE PROBLEMS THE PUBLIC SEES  
AS "COST OVERRUNS"**

# COST OVERRUN HISTORIES OF 45 WEAPON SYSTEMS \*



\* AS CURRENTLY REPORTED ON DOD SAR'S IN JUNE 1972



# **PLANNING ESTIMATES HAVE BEEN LOW HISTORICALLY**

**HARVARD STUDY 1962 — 12 WEAPONS**

**AVERAGE DEVELOPMENT COST**

**THREE TIMES**

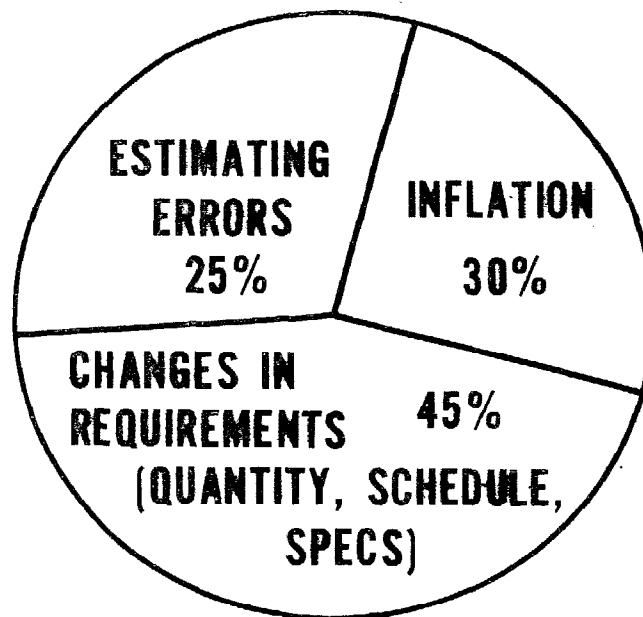
**THE ORIGINAL ESTIMATES**

**RAND STUDY 1959 — 22 WEAPONS**

**COST INCREASES DURING DEVELOPMENT WERE**

**200% — 300%**

## WHAT CAUSES OVERRUNS?



DATA TAKEN FROM ANALYSIS OF COST CHANGES IN 45 WEAPON SYSTEMS  
REPORTED IN JUNE 30, 1972 SAR'S

## **ESTIMATING ERRORS (25%)**

**BOTH BUYER AND SELLER HAVE STRONG MOTIVATIONS TO ACCEPT  
LOW COST ESTIMATES IN A COMPETITIVE ENVIRONMENT**

**● THE BUYER OVERSTATES PERFORMANCE TO GAIN  
APPROVAL OVER COMPETING SYSTEMS**

**● THE SELLER UNDERSTATES THE COST DUE  
TO OPTIMISM**

**● BOTH UNDERESTIMATE THE SHEER DIFFICULTY OF  
PREDICTING THE UNKNOWN**

## **INFLATION (30%)**

- **DOD HAS REPORTED ITS FINDINGS TO THE COMMITTEE**
- **THE GOVERNMENT IS LEARNING HOW TO COPE WITH THIS PROBLEM IN CONTRACT ESCALATION CLAUSES**

## **SPECIFICATION CHANGES (45%)**

**THIS MAY BE THE MOST IMPORTANT CAUSE OF OVERRUNS  
WHICH RESULT FROM—**

- TRYING TO DO TOO MUCH — CHALLENGING THE STATE  
OF THE ART FRONTIER**
- TRYING TO DEVELOP AND PRODUCE THE SYSTEM TOO FAST**

**THESE CHANGES AFFECT QUANTITY, SCHEDULE AND  
PERFORMANCE SPECIFICATIONS**

# **REFORMS PROPOSED BY MOST AUTHORITIES STRESS THREE KEY OBJECTIVES**

- **MAKE THE RIGHT DECISION AT THE OUTSET**
- **AVOID PITFALLS WHICH LEAD TO SLIPPAGES AND  
OVERRUNS**
- **STRENGTHEN MANAGEMENT OF THE ACQUISITION  
PROCESS**

**SEVERAL YEARS WILL BE REQUIRED TO IMPLEMENT THE  
RECOMMENDATIONS WHICH SUPPORT THESE OBJECTIVES**

## **A. MAKE THE RIGHT DECISION AT THE OUTSET**

### **1. OSD, SERVICE AND CONGRESS SHOULD AGREE ON:**

- **OPERATIONAL MISSION NEED**
- **COST LIMITS**

**(THIS IS ENVISIONED IN DRAFT DIRECTIVE 5000.2)**

### **2. PROVIDE SECDEF BETTER FACTS FOR DECISIONMAKING**

- **STRENGTHEN DSARC STAFF**

### **3. EXTEND THE SPAN OF AUTHORIZATIONS.**

### **4. STRENGTHEN CONGRESSIONAL REVIEW**

- **THESE PROPOSALS ARE IN CONSONANCE WITH THE  
JOINT STUDY COMMITTEE ON BUDGET CONTROL**

## **B. AVOID PITFALLS WHICH HISTORY SHOWS HAVE LEAD TO SLIPPAGES AND OVERRUNS**

**5. AVOID CONCURRENT DEVELOPMENT AND PRODUCTION**

**6. STRESS MAXIMUM, BUT AUSTERE, DESIGN COMPETITION**

- **SMALL DESIGN TEAMS**
- **SMALL EXPERIMENTAL SHOPS**
- **DESIGN TO COST**
- **INCREMENTAL DESIGN**
- **AUSTERE PROTOTYPES**
- **MINIMUM DOCUMENTATION**
- **CONTINUOUS SUBSYSTEM DEVELOPMENT**



## **B. AVOID PITFALLS . . .CONT'D**

- 7. ENCOURAGE EFFECTIVE TEAM PERFORMANCE BETWEEN THE GOVERNMENT AND THE CONTRACTOR DURING DEVELOPMENT**
- 8. EMPHASIZE "LIFE CYCLE COSTING" TO IMPROVE COST-EFFECTIVENESS STUDIES AND DECISIONS**
- 9. CONTINUE TO IMPROVE COST ESTIMATING TECHNIQUES**
  - INCLUDING THE USE OF PARAMETRIC ESTIMATES**

**C. STRENGTHEN THE MANAGEMENT OF THE  
ACQUISITION PROCESS**

**10. PROGRAM MANAGERS AND PROCUREMENT SPECIALISTS**

**UPGRADE THEIR COMPETENCE, STATURE AND TENURE**

**11. TEST AND EVALUATION**

**ESTABLISH A SEPARATE ORGANIZATION IN EACH SERVICE INDEPENDENT  
OF DEVELOPER AND USER**

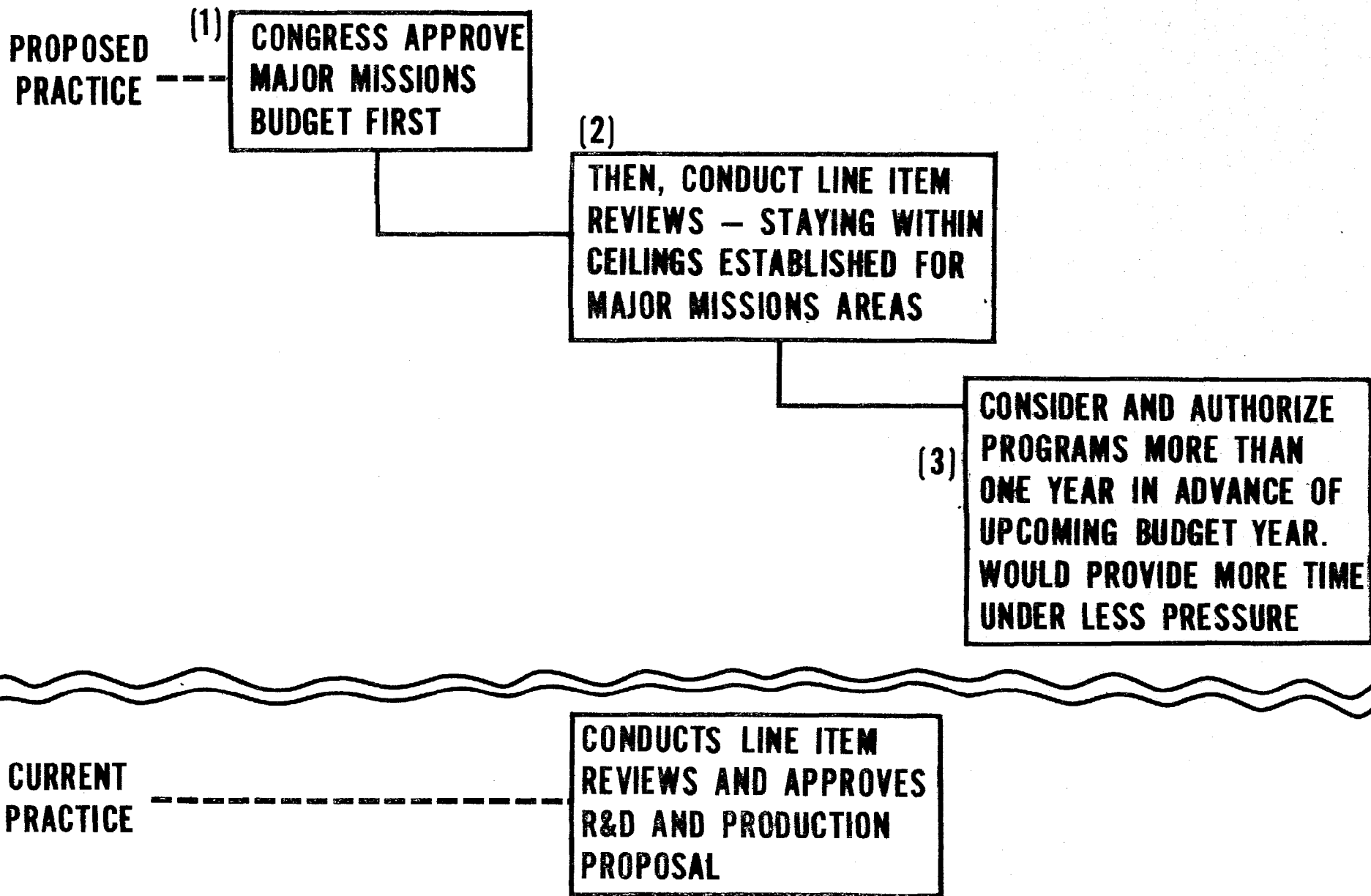
**12. DEPUTY SECRETARY FOR MISSION ANALYSIS AND  
SYSTEMS ACQUISITION**

**NEW POSITION HAS BEEN AUTHORIZED**

**13. THE INDUSTRIAL BASE**

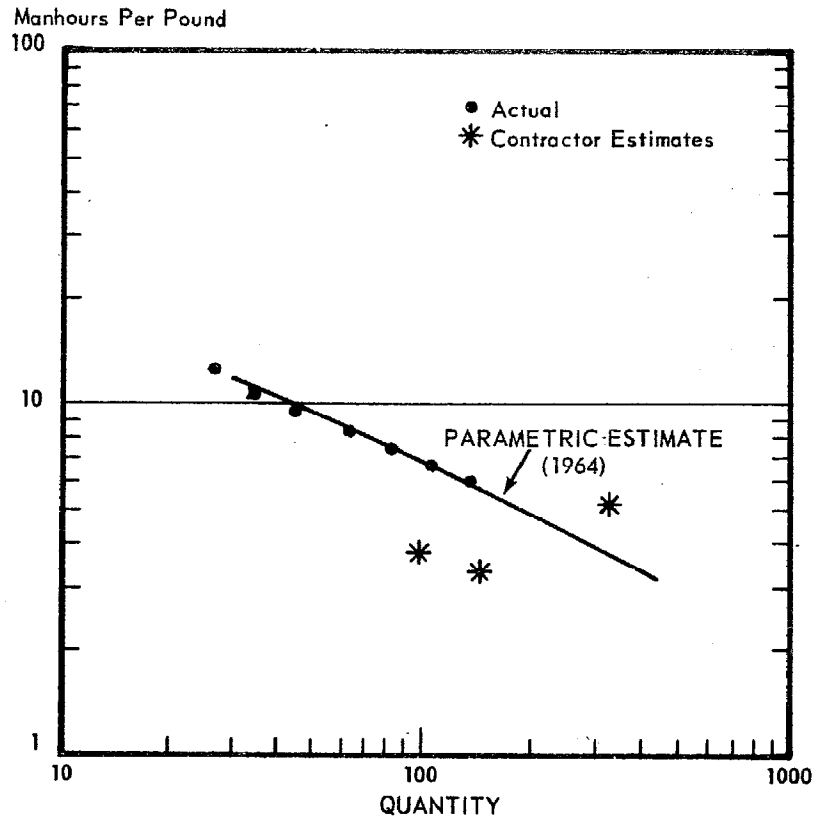
**IMPROVE THE PLANNING FOR MAINTAINING AN ADEQUATE DEVELOPMENT  
AND PRODUCTION INDUSTRIAL BASE**

# ILLUSTRATION OF REVISED CONGRESSIONAL REVIEW PROCESS

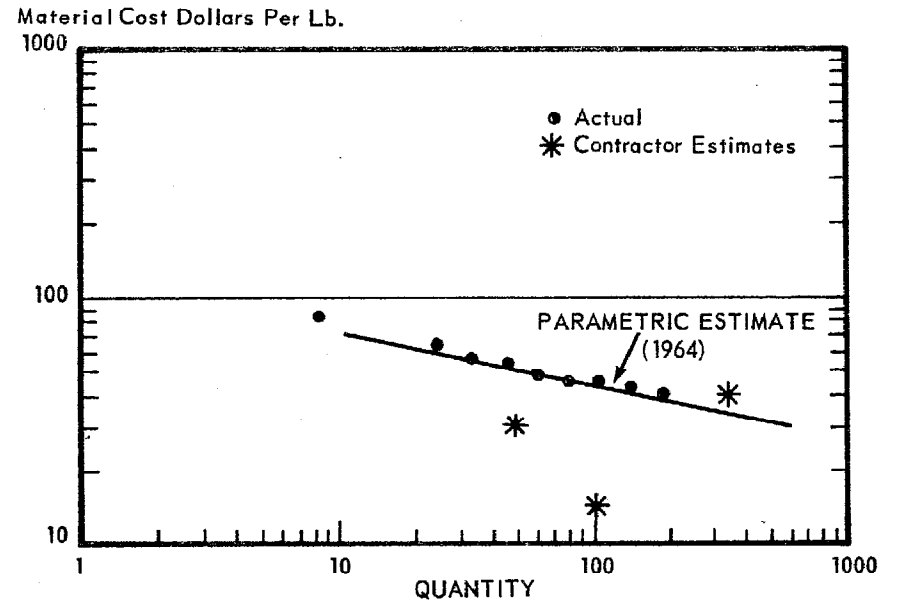


## PARAMETRIC ESTIMATES CAN BE HELPFUL IN PREDICTING TOTAL COSTS

### PARAMETRIC ESTIMATE OF MANHOURS REQUIRED

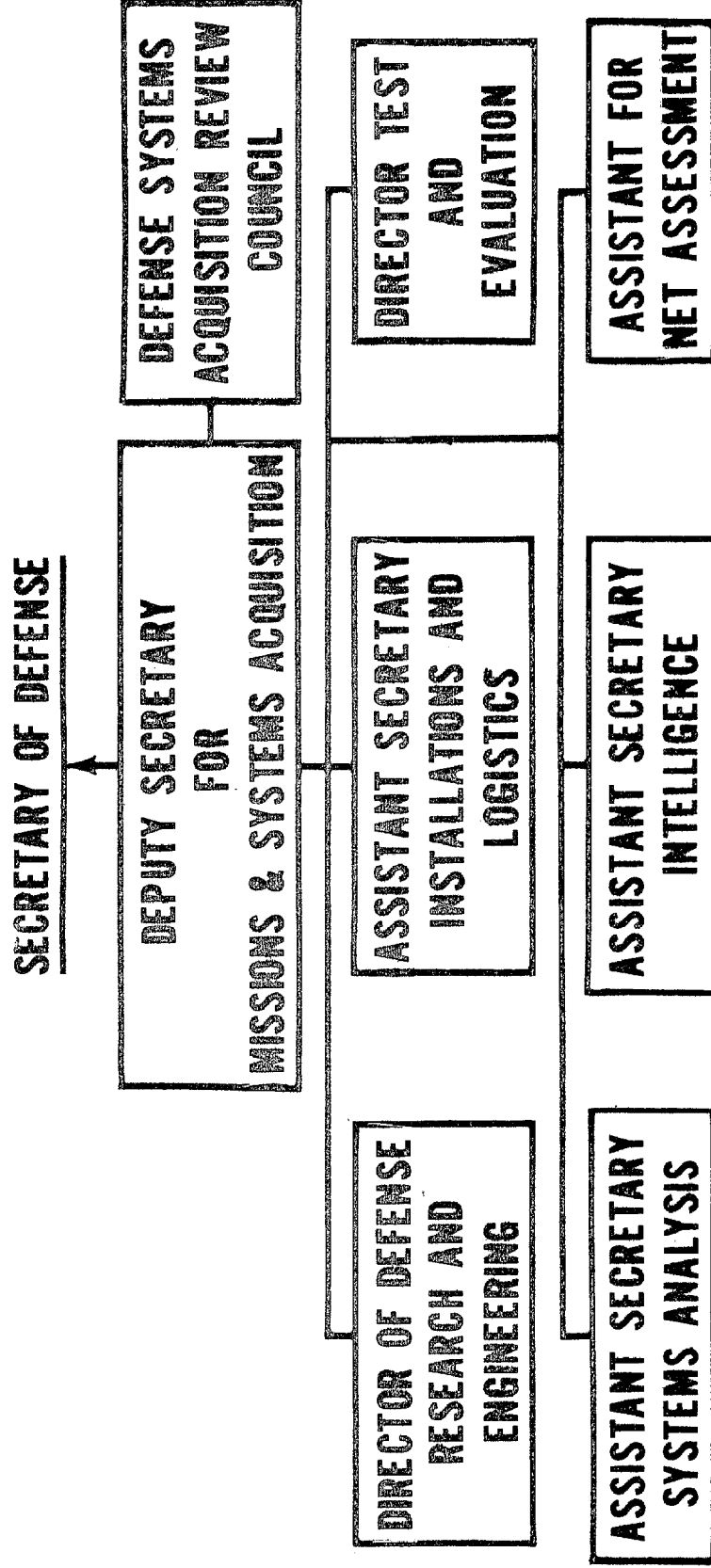


### PARAMETRIC ESTIMATE OF MATERIAL COST



(ILLUSTRATIVE CHART)

GAO'S CONCEPT OF  
DEPUTY SECRETARY OF DEFENSE FOR MISSION ANALYSIS  
AND SYSTEMS ACQUISITION



**SUGGESTED NEXT STEPS FOR THE RESPONSIBLE COMMITTEES**

- 1. WORK WITH DOD AND OMB IN DEVELOPING AND TESTING TECHNIQUES OF STRENGTHENING CONGRESSIONAL REVIEW -- STRESSING MISSION BUDGETS.**
- 2. PRESS FOR ADOPTION OF THE PROPOSALS OF THE COMMISSION ON GOVERNMENT PROCUREMENT RELATED TO R&D, SYSTEMS ACQUISITION, AND GENERAL PROCUREMENT PRACTICES.**
- 3. ARRANGE FOR PERIODIC REVIEWS OF DOD PROGRESS IN IMPLEMENTING OTHER IMPROVEMENTS**

REPRESENTATIVE SUMMARY  
COMMENTS FROM AUTHORITATIVE  
SOURCES

ON CAUSES OF COST GROWTH

Dr. Alexander Flax, president of the Institute for Defense Analyses, notes for example, that "on the average, costs for the heavier, more-complex class of combat aircraft have increased by a factor of 10 about every 18 years." Although some of this increase is attributable to inflation, he notes that:

\*\*\*most of the increase is attributable to increasing technological complexity in airframe, engines, accessories, and avionics; by increases in size and weight and by more costly materials, processes and fabrication techniques. There have, of course, been corresponding increases in performance, speed, range, load-carrying capability and also increases in military mission capabilities such as accuracy of navigation and precision of weapon delivery.

Further he says that the quickening pace of technology for airframes, engines, and avionics has led to ever more frequent and expensive requirements, to pay the "price of entry" into new materials, processes, design approaches, manufacturing methods, and operational techniques.

The former Deputy Secretary of Defense, David Packard, in addressing the Armed Forces Management Association dinner in 1970 said, "The Defense Department has been led down the garden path for years on sophisticated systems."

The Brookings Institution\* observes that "Between 1950 and 1968 the real cost of the average bomber and military transport plane increased three times and of the average fighter nearly eight times." These increases are attributed principally to the higher performance demanded of each system and the accompanying system complexity needed to achieve it. Brookings warns that the cost-number tradeoff cannot continue indefinitely.

\*Charles L. Schultze, Edward R. Fried, Alice M. Rivlin and Nancy H. Teeters, *Setting National Priorities, the 1973 Budget* published by the Brookings Institution, Washington, D.C., 1972.



ON CONSEQUENCES OF COST GROWTH

Senator John Stennis, Chairman of the Senate Committee on Armed

Services said:

If we can afford a permanent force structure of only one-fifth as many fighter aircraft or tanks as our potential adversaries - because our systems are about five times more expensive than theirs - then a future crisis may find us at a sharp numerical disadvantage.

The Senate Committee on Armed Services expressed another concern, that "the multiplying cost of weapon system development and procurement is reaching such prohibitive levels that the country may be unable to afford some of the most vital weapon systems."

Deputy Secretary of Defense Kenneth Rush adds that "we too often reduce the number of units to stay within previous cost projections. We can no longer afford to reduce the quantity just because we need modern equipment to maintain our military posture."

John S. Foster, Jr., Director, DDR&E recently said that "We can no longer continue to buy adequate quantities of needed weapons if the unit procurement and lifetime costs of more weapons continue to soar."

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ON COST ESTIMATING

In a recent report on cost estimating for major acquisitions, we stated that:

For the acquisition programs we reviewed, \*\*\*  
[detailed] estimates were consistently under-  
stated. \*\*\*Without realism and objectivity  
in the cost estimating process, bias and over-  
optimism creep into the estimates prepared by  
advocates of weapon systems and the estimates  
tend to be low.

The Blue Ribbon Defense Panel reported that:

The implicit assumption that technical risks can  
be foreseen prior to commencement of development  
has proved wrong. \*\*\*It follows that the belief  
that detailed pricing techniques for the total  
systems acquisition effort can be accomplished  
during Contract Definition is equally false.  
Only gross pricing techniques such as parametric  
pricing are likely to provide accurate forecasts  
of ultimate costs of weapon system.

Mr. Packard states that "As an example, parametric cost  
estimates, which can predict costs within 10% or so, predicted  
that both the F-111 and the C-5A contract bids were much below  
what the costs were likely to be."

ON CHANGES IN REQUIREMENTS

Deputy Secretary Packard described these problems in the following words.

\*\*\*I have noted that another major contributor to cost growth consists of changes which we make in a program during both the development phase and the production phase. While I know there is a valid need for some changes, much improvement is possible in this area. Many of the changes of the type currently being made can be and must be avoided. This can be accomplished, in part, first by assuring that we do a better and more complete job of defining what we really needed in a system before entering full-scale development and, second, by the vigorous review and elimination of the many 'nice' or 'desirable' features which so often creep into these systems as they proceed through development and production.

On the subject of concurrency, he wrote:

Almost without exception the programs in trouble had been structured so that production had been started before development was complete\*\*\*. Of all the major programs which we examined, there was hardly even one which kept to the original schedule. In every case if more time had been taken to complete the development before production was started, the new weapon would in fact have been available to the forces just as soon but with fewer problems and at a lower cost.

GAO's 1971 report on system acquisition made the following points on engineering changes.

Incomplete descriptions of initial performance specifications and changes required to bring system performance up to expected standards have resulted in substantial need for engineering changes. Of the \$4 billion in engineering changes reported by the three Services, about \$3.1 billion was accounted for by the Air Force for the F-111, the C-5A, and the MINUTEMAN programs. Engineering changes totaling \$1.8 billion were required to bring the F-111 and C-5A to expected standards, and \$730 million involved changes in the MINUTEMAN to upgrade the system to meet an increased threat.

SOLUTIONS TO WEAPON SYSTEMS ACQUISITION PROBLEMS

PROPOSED BY VARIOUS AUTHORITIES

a. In July 1970 the Blue Ribbon Defense Panel suggested five actions.

- Introduce more flexibility.
- Rely more on hardware development than on paper studies.
- Increase the number of decision points in the acquisition cycle.
- Develop subsystems and components not necessarily tied to a given system.
- Avoid concurrency between development and production, ban total-package procurement, eliminate gold-plating, simplify paper work, etc.

b. In 1970, NSIA found that basic improvements in weapons acquisition required:

- Early consultation between DOD and industry "as to the state-of-the-art, schedules, costs, and attendant risks."
- Use of cost-reimbursement contracts until all significant technical unknowns have been resolved.
- Simplification of specifications.
- Elimination of unnecessary layers of management and greater continuity in program manager assignments.
- Reduction of management systems and reports.

The above proposals, issued on the same date as the Blue Ribbon Defense Panel report, closely parallel those of the Panel.

c. GAO, responding to the growing concerns of the Congress, began a series of case studies of problems of cost growth, scheduling, and performance slippage in selected weapon systems.

In addition to these individual studies, overall reports to the Congress were published on February 6, 1970, March 18, 1971, and July 17, 1972, each entitled "Acquisition of Major Weapons Systems" (B-163058).

The first two reports stressed the importance of:

- More effective procedures in determining what weapon systems were needed in relation to DOD missions.
- Better preparation and use of cost-effectiveness studies.
- Strong management control over major systems programs.

The 1972 report (pp. 58 and 59) reiterated the importance of those actions but gave additional attention to (1) the need for appropriate testing and evaluation prior to key decision points in the acquisition cycle and (2) consistent and effective cost-estimating procedures. The 1971 report (p. 1) made the observation that:

GAO has found that generally the newer weapon procurements are following a slower development pace and procurement practices are more conservative than those of earlier periods \* \* \* evidence of the results of the changed concepts is not yet available to adequately assess them, but the outlook is brighter.

d. The Commission on Government Procurement, after an intensive study, outlines a comprehensive group of proposals. Some of the Commission's key recommendations are:

- Start acquisition programs with the Secretary of Defense's statement of needs and goals and responsibility assignments to agency components.
- Begin annual congressional reviews with agency mission deficiencies and the needs and goals for new acquisition programs.
- Create systems candidates by sponsoring the most promising industry proposals from all qualified sources.
- Authorize and appropriate research and development funds for exploring system candidates by agency mission.
- Maintain competition between the most promising system candidates by annual fixed-level awards and careful agency monitoring.
- Choose preferred systems using mission performance test data and projected ownership costs.
- Approve (by the agency head) systems chosen without competition and subject them to special controls.

- Support full production decisions by independent and strengthened test organizations.
- Use contracting function as an important tool of systems acquisition but not as a substitute for management control; use guidelines in lieu of detailed procurement regulations.
- Unify policy and monitoring at top and intermediate management levels. These levels would integrate policy decision-making and monitoring functions, such as those now in Installations and Logistics and in Research and Engineering.

These proposals reconfirm and reinforce many of those made by other authorities in recent years. The Commission places great stress on measures needed to avoid the premature lock-in to a single-system approach without thoroughly evaluating the basic need for a new level of capability and what it is worth before less costly systems alternatives are eliminated. The Commission states that "one of the main reasons new defense systems have become increasingly complex and costly is that current acquisition procedures tend to say from the outset that they are the minimum kind 'needed.'"

e. The RAND Corporation, summarizing its many reports on system acquisition, said that, although cost-estimating methods could be improved, the result would be fewer unpleasant surprises about cost growth but would do little to improve the acquisition process itself. RAND believes that the following changes are necessary.

- a. Separate the development phase from the production phase both sequentially and contractually.
- b. Conduct the initial segment of development in an austere manner. Concentrate first on demonstrating system performance. Defer detailed production design and proof of reliability.



SOLUTIONS TO WEAPON SYSTEMS ACQUISITION PROBLEMS  
UNDERWAY BY THE DOD

In the last several years, the DOD has begun new policies and procedures, highlighted by Directive 5000.1, to govern major acquisitions.

- the Defense Systems Acquisition Review Council (DSARC) was established to formalize Secretary of Defense decisions on individual systems. This deliberating group advises, at critical milestones, on a system's readiness to move into the next phase of acquisition.
- In many cases, DOD is requiring hardware demonstration with actual prototypes and relying less on paper analysis to support weapon program decisions.
- Cost reimbursement type contracts are becoming the rule instead of fixed-price contracts. There is now more leeway to tradeoff among performance, time, and cost considerations.
- DOD has begun separating development from production on programs already in progress, e.g., the F-15 and B-1 programs. Testing or "fly before buy" is being stressed.
- The testing function is being separated from the developing function in the Services. An organization has been established in OSD to oversee testing. Its head reports directly to DSARC and the Secretary of Defense.
- Parametric cost estimating is now required for new programs.
- Support by the three military departments a Cost Analysis Improvement Group was established in OSD to establish standards for cost estimating. It provides independent review of cost estimating to support DSARC reviews.

---A "design to cost" acquisition strategy is being formalized.

---A mixed capability force termed a "high-low force mix" is emerging. A small number of high performance weapon systems will augment larger standard force for less total costs. For example, the new XM-1 tank will be supplemented by the older M-60's.

Further tightening of control being considered by the Deputy Secretary of Defense is embodied in the proposed Directive 5000.2.

It would

---establish OSD-Service agreement on the operational need for a new system, and the limit of resources to support the need

---Plan a much more thoroughly advanced development analysis of system alternatives. It would be done before the system choice is made and before engineering development resources are committed.