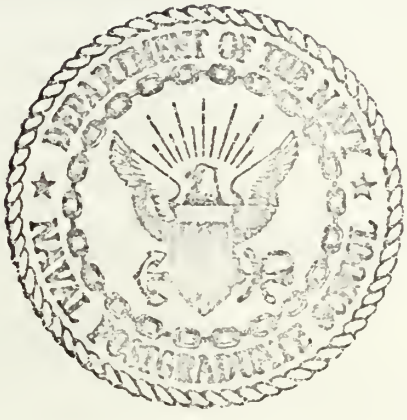
AN EVALUATION OF THE NAVY'S SELECTED ACQUISITION REPORTING SYSTEM

Lonny Kay McClung



THESIS

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by

Lonny Kay McClung

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This thesis investigates the Selected Acquisition Reporting (SAR) System in order to evaluate its effectiveness. Significant problem areas associated with the SAR and the reporting criteria of DOD Instruction 7000.3 (series) are examined.

The data presented were collected by telephonic survey and personal interview with users, reviewers, and producers of the SAR. This was augmented by analysis of actual SARs for a

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Although many of these issues require further study, proposals are presented to improve the effectiveness of the SAR and alleviate some of the controversy that now exists concerning the SAR.

An Evaluation of the Navy's Selected Acquisition Reporting System

by

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Submitted in partial fulfillment of the
requirements for the degree of

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June 1975

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ABBREVIATIONS AND ACRONYMS

ASD	Assistant Secretary of Defense
ASN	Assistant Secretary of the Navy
ASPR	Armed Services Procurement Regulation
CAIG	Cost Analysis Improvement Group
CE	Current Estimate
CNM	Chief of Naval Material
CNO	Chief of Naval Operations
CPI	Consumer Price Index
CVAN	Nuclear Aircraft Carrier
DCP	Development Concept Paper
DDR&E	Director, Defense Research and Engineering
DE	Development Estimate
DOD	Department of Defense
DSARC	Defense Systems Asquisition Review Council
FM	Financial Management
FYDP	Five Year Defense Plan
GAO	Government Accounting Office
I&L	Installations and Logistics
NAVAIR	Naval Air Systems Command
NAVCOMPT	Comptroller of the Navy
NAVMAT	Naval Material Command
NAVSEA	Naval Sea Systems Command
NASA	National Aeronautics and Space Administration
NMARC	Navy Marine Corps Acquisition Review Committee
NPS	Naval Postgraduate School
OASD	Office of the Assistant Secretary of Defense
OPNAV	Chief of Naval Operations
PA&E	Program Analysis and Evaluation
PCD	Program Change Decision
PDM	Program Decision Memorandum
PE	Planning Estimate
PM	Program Memorandum
P/M	Project Manager
POM	Program Objective Memorandum
PPBS	Planning, Programming, and Budget System
RDT&E	Research, Development, Test, and Evaluation
SAR	Selected Acquisition Report
SECNAV	Secretary of the Navy
SYSCOM	Systems Command
TDP	Technical Development Plan
WPI	Wholesale Price Index

I. INTRODUCTION

A. GENERAL

The past decade has seen the acquisition of major weapons systems characterized by cost growth in almost every major program. Much study has been devoted to the cost growth issue and its impact by such organizations as the Government Accounting Office (GAO), the Department of Defense (DOD), the Commission on Government Procurement, the Blue Ribbon Defense Panel and most recently the Navy Marine Corps Acquisition Review Council (NMARC).

Current austere defense budgets coupled with severe inflation and spiralling weapons systems costs have created extreme pressure at all levels of acquisition management to check and/or reduce the incidence of weapons system cost growth. During the involvement in the Vietnam war and to a lesser degree today, members of Congress have found it politically expedient to attack the management of defense systems. These attacks serve to intensify the pressure at every level of management within the DOD. A series of budget, program review, and cost information systems have been introduced which were designed to improve the weapons system acquisitions process and control costs. They include the Development Concept Paper (DCP), the Planning, Programming, and Budgeting System

(PPBS), and the Selected Acquisition Report (SAR). These have had a profound impact on the Defense Procurement Establishment. They have provided additional information to assist the DOD and/or the Congress in improving the acquisition process. This thesis will limit its discussion to the SAR system and more specifically to the SAR as it applies to and is used for the reporting of Navy weapons systems. The author will evaluate the Navy SAR system and discuss its effectiveness in presenting the true status of the programs. Major problem areas will be identified and specific issues raised by the GAO concerning the SAR will be discussed. Due to the time constraints imposed on this effort, detailed investigation into all problem areas was not possible. However, based on the results of this study, specific recommendations will be made for improvement of the Navy SAR system. Specific questions addressed are listed at the end of Chapter II.

II. SAR DESCRIPTION AND BACKGROUND

A. DESCRIPTION

The SAR is a quarterly report originated by the Project Manager (P/M) of each major weapons system procurement which summarizes the cost, schedule, and performance data for the program. Major procurements are those "requiring a total cumulative financing for Research, Development, Test and Evaluation (RDT&E) in excess of $50 million or cumulative production investment in excess of $200 million."[1] Reporting is normally initiated on a program after it has been approved by DSARC II and been included in the Five Year Defense Program (FYDP). DSARC II is the second major decision point in the life of a new system. It is conducted by the Secretary of Defense and is a comprehensive program review required for authorization of full scale development of the new weapon. The FYDP is the DOD forecast of future expenditures.

B. HISTORY

The requirement for the SAR was first established by the DOD Instruction 7000.3 dated 23 February 1968. Initially the SAR was designed and intended only for the use of its sponsor, the Assistant Secretary of Defense

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[1]DOD Directive 5000.1, "Acquisition of Major Defense Systems," 13 July, 1971.

(Comptroller). A total of eight DOD programs were included in the 1968 experimental phase of the SAR program.

In the early part of 1969 Secretary of Defense Laird articulated the requirement to be regularly advised of the status of major acquisitions. At that time the external criticism of defense system acquisition management plus growing concern over related cost growth presented the need for feedback information which could be compared against budget, performance, and schedule plans to highlight program status and problem areas. The SAR was recognized as a potential vehicle that would fulfill such a requirement. The SAR directives were revised to reflect the new user and the program moved out of the experimental phase.

During approximately the same time frame GAO and Congressional interest in acquisition was intensified as a result of hearings on Government procurement, the Anti-Ballistic Missile System and the C-5A.[2] These systems were experiencing significant growth in cost estimates.

In April, 1969, Senator Stennis, Chairman of the Senate Armed Services Committee, requested that DOD furnish his committee, on a recurring basis, progress data on major weapons systems which were in various stages of procurement. Additionally, the Deputy Secretary of Defense requested that the services nominate additional systems

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[2] DOD Cost Research Symposium Report, 24 March 1970, Volume I, Page 4.

for reporting, using as the criteris, "Those systems which might experience technical difficulties and/or cost growth."[3] The SAR program and directives were again revised to reflect the Congressional user. On 3 September, 1971, the current DOD Instruction 7000.3 was issued. In April, 1972, Change 1 was issued and today that remains the official SAR reference document. That change was not a major one. Most of the major changes occurred in the 1970-71 time frame.

Since 1972 the Instruction has not been revised; however, a large number of memoranda changing the reporting format and content have been issued. Currently there are 40 programs on the list of Congressional SARs. Eight other programs submit SARs to the DOD level only.

C. SAR PURPOSE

The Secretary of Defense considers the SAR to be, "The official DOD source to be used as a basis for outside reporting on weapons system acquisition."[4] It is the key recurring summary by which DOD reports to the appropriate committees of the Congress on the progress of selected major weapons systems.

The SAR, in theory, provides the "textbook" or classic example of a management information control mechanism. Planning and current estimates are presented for quantity, performance, and technical

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[3] IBID, P 4.

[4] IBID, P 3.

characteristics, schedules, and cost. Variance analysis and explanations are presented for most areas where deviations from the plan are encountered. This, by definition, is the function of a control sub system in a "traditional" management system. The feedback loop in the SAR system is accomplished when the reviewed SAR is signed, sent to the Congress, and a copy returned to the originator (P/M) for use as the base submission of the next SAR 90 days later.

D. SAR CRITICISM

Despite its potential as the "ideal" management information tool, the SAR system has come under an increasing amount of criticism. The Congressional user has questioned the accuracy of the SAR and further criticized it for being "untimely."[5] Some project managers have indicated they felt the SAR was a waste of time. Some DOD reviewing officials have expressed the view that the SAR was unrealistic. The Commission on Government reported on management information systems such as the SAR:

> Congress often cannot act as a credible and sensible check on an agency because acquisition programs provide no handles to enable Congress to interrelate the purpose of the new system and the dollars being spent on them with national policies and needs. Instead data is presented to Congress in "traditional" forms, inviting attention to already defined products and annual budget incruments that finance development and production.[6]

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[5]Comptroller General of the U.S., "How to Improve the Selected Acquisition Reporting System," 27 March, 1975.

[6]Federal Contracts Report, Number 470, 5 March 1973, Page A-17.

GAO applied similar criticism directly to the SAR in its 25 March 1975 report to the Congress when it questioned why the SAR does not compare system performance with the enemy threat and national need.[7] Other Congressional criticism was recorded in the House Appropriations Committee report of 11 September 1972. The Committee noted that the SAR:

... was untimely

... had no "audit trail" existing to explain differences between development and planning estimates

... has no firm guidelines against which to measure additional procurement costs

... has no statement to estimate the probability of the weapons system achieving its primary mission or meeting its original contract specifications.[8]

E. QUESTIONS

Specifically the author will address questions associated with function, concept, and improvements of the SAR.

. . . Does the SAR accurately transmit the true status of the program? (Chapter IV)

. . . What is/should be the role of the SAR? (Chapter V)

. . . Is the report timely? (Chapter VI)

. . . Is there too much review? (Chapter VI)

. . . Should the P/M report directly to the Congress via the SAR? (Chapter VI)

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[7] Comptroller General of the U.S., P. 6.

[8] Navy, Marine Corps Acquistion Review Committee Report, January 1975, Pave VII - 58.

. . . How are the cost data computed? (Chapter VII)

. . . What is the impact of escalation? (Chapter IX)

. . . Could the SAR be improved and, if so, how? (Chapter XII)

The author will attempt to answer these and other important questions and criticism of the SAR.

There are other questions that have been raised concerning the SAR; however, due to the time constraints on this research effort, only those issues considered by the author to be major ones could be examined.

III. RESEARCH TECHNIQUE

A. SAR ANALYSIS

In order to adequately conduct research into the SAR the author found it necessary to visit the Washington D.C. area to interview the users, producers, and reviewers of the SAR. First he conducted a comprehensive analysis of the Navy SARs on file at the Naval Postgraduate School (NPS) Library. Next, intensive library research was conducted to locate and familiarize the researcher with past and current literature in the field of Selected Acquisition Reports. Although visits to the Stanford, NASA Ames, and Naval Postgraduate School Libraries produced no literature specifically covering the subject, the library material examined did serve to broaden the author's knowledge in the field of Systems Acquisition.

Next an extensive telephonic survey was conducted on a large number of individuals who were users, reviewers, and producers of SARs. This served to provide an effective foundation for the ensuing interviews by stimulating those called to consider the basic ideas of the research prior to my arrival.

B. INTERVIEWS

The following organizations assisted in the research by participating in interviews with the researcher: GAO, Office of the Assistant Secretary of Defense (OASD) for

Program Analysis and Evaluation (PA&E), OASD (Comptroller), Assistant Secretary of the Navy (ASN) for Financial Management, Chief of Naval Operations (CNO) OP-96D and OP 902, and Chief of Naval Material (MAT-023). Project Offices/Project Managers interviewed were: F-14, DD-963, LHA, PF, S-3, Lightweight Torpedo, CVAN, A-7, Trident, and Harpoon.

IV. INITIAL PERCEPTION AND ANALYSIS

A. MISCONCPETION

The author's initial perception was that the SAR was extremely weak and ineffective as a management information system. This notion was based mainly on the amount of criticism the system had received from various levels of the users, producers, and reviewers of the SAR. Part of this misconception stemmed from the assumption that most Navy Project Managers would be erroneously presenting their program in the SAR as one with no problems.

The initial methodology for testing the effectiveness of the SAR was to analyze a representative sample of the SARs in the NPS Library to determine how the P/M presented the status of his program. The author intended to gather data demonstrating that a large number of the major programs presented a "completely optimistic" status when, in fact, they were experiencing considerable difficulty. If historical data, which were available at the time the SAR was published, could have been produced which proved the existence of project difficulties, even though the P/M reported an overly optimistic program status, then the point could have been made that the SAR system had a major flaw which rendered its effectiveness questionable.

It was logical then to examine programs that had experienced known cost, performance, or schedule

difficulties. Before discussing the survey results, it would be helpful for later analysis to discuss briefly some other forces which impact on the status reporting.

B. P/M REWARDS AND PRESSURES

The problem of truly accurate status reporting and P/M "optimism" was a more complex issue that might immediately be apparent. It involved not only the mechanics of executing the implementing DOD Instruction concerning SARs but subtly and perhaps more important the behaviorial aspects of the rewards, career patterns, and measures of success associated with Project Management. As one interviewee stated, "The P/M is rewarded for putting ships in the water or aircraft in the air. He can't give pessimistic estimates in the SAR for fear of the program being cancelled."[9] Another said, "He (the P/M) must keep the project alive at all costs."[10] Most weapons are needed to meet an operational threat on a "close" time schedule. Couple that fact with the lengthy procedures for initiating a new program plus the austere budget climate and you have the genesis of the CNO program sponsors pressure on the P/M to "make the system work." This pressure plus career enhancement, and rewards for delivering the system to the fleet could

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9 Name withheld by request.

10 IBID.

easily motivate the P/M to present the system status in an "optimistic" light. Lourette further showed that these kinds of pressure induce the P/M to make program decisions that later result in cost growth.[11]

C. "OPTIMISM"

The quarterly recurring nature of the SAR gives the P/M further opportunity to exercise some "optimism." The intense Congressional and DOD concern over cost growth plus the nature of the strongly motivated, highly dedicated, and enthusiastic officers in P/M billets in most cases leads them to exercise their best management efforts toward preventing such cost increases. The Financial Manager for one program whose SARs recently showed a significant unforecasted cost increase stated, "The PM knew 18 months ahead of time that the contractor was forecasting this increase but he vowed to control the program in such a way as to not let it happen."[12]

An associated subtle influence on publishing the true status of the program deals with the assignment and rotation of PMs. Some major programs may have a 10-15 year acquisition cycle. During that time the average PM may

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[11] Lourette, Richard J., "The Relationship Between Pressure on the System Program Director and the Growth of Weapons Systems Cost Estimates," Boston, Harvard University, 1969.

[12] Name withheld by request.

have a 2-3 year total in the Project Office. These rotations offer an excellent opportunity for the outgoing PM to exercise some of the above mentioned "optimism." If there is a problem, it is relatively easy to defer it in hopes the new PM will have to handle it. When the outgoing PM moves on, his fitness report (i.e. reward) normally reflects the known program status at detachment. That being the case, the incentive then certainly exists for optimism. When the problem later surfaces the incoming PM cannot be held accountable for the problems of the previous manager. This was the thrust behind Secretary Packards guidance concerning the selection and assignment of the PM.[13] Progress has been made in this area but further improvement is needed. However, it is easy to see that the top performing PM who is motivated toward continued promotion could easily be tempted to leave the program with the illusion of "no problems." Current PM rotation plans call for changing at major program milestones such as DSARC II or DSARC III (production decision). These major reviews should "clear the air" of most major problems and alleviate PM "optimism."

D. FINDINGS

With this foundation the author analyzed the complete NPS SAR files on approximately half of the current list of Navy Programs reporting under DOD Instruction 7000.3.

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[13] DOD Directive 5000.1.

The author's initial perception about the presentation of a no problem status was quickly disproved. There were a few examples of "optimism" found. The only sample found that supported the author's original perception was:

> "The development program is on schedule and within budget constraints."[14]

The following quarter this project reported a significant cost growth in the total projected outlay to acquire the system. The small incidence of such "optimism" disproved my initial perception.

In fact, the majority of the programs studied presented varying degrees of problems ranging from very minor to moderately severe.

For example one major program's SAR reported at the 20% completion point as follows:

> Progress reports based on the 12 month or more delay in delivery addressed in (a recent SAR)* indicate continued slippage in the detail design issues, reducing the Navy's level of confidence that the revised schedule delivery dates would be met. The contractor has incurred an additional 7½ months slippage for the first unit to 12 months slippage for the last unit delivery in (his latest proposal).*[15]

Concerning the cost estimate on another program, the SAR reported that the contractor has:

> (1) Expected to go to ceiling, and (2) would propose a new escalation clause which would provide escalation payments over the full construction period - about one year longer than planned.[16]

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[14] Program name withheld to avoid classification.

[15] *Program name, contractor, and dates deleted to avoid classification.

[16] IBID.

Even the most casual observer could discern that these programs were experiencing difficulties from such SAR comments. The programs mentioned are still active and currently are experiencing further cost growth. Most programs which did experience cost growth and schedule difficulties then clearly did not present an absence of problems in their reporting. While there were other areas that detracted from the effectiveness of the SAR, P/M statement of no problems was not one of them.

E. INTERVIEW RESULTS

Based on the high potential and rewards for expressing the program "optimistically" the author did not dismiss his initial perception solely on the basis of the analysis of SARs. Every interviewer was questioned as to his impression as to whether the SAR presented the true status of the program. As earlier criticism might suggest, the spectrum of answers varied from "extremely accurate" to "almost inaccurate" in presenting the true status. Again the bias of user/producer was evident; the producers generally believing the SAR to be accurate and the user calling them ineffective. The SAR reviewers generally believed the SAR to be effective. The author concluded that the SARs were reasonably accurate with a slight tendency toward the "optimistic" side. This was based on the extensive review procedure for program status; not only the SAR review but DSARC and periodic status reviews. These

reviews are keyed to revealing problem areas so that, while the P/M might be able to cover up cost growth for a time, they will eventually be disclosed. Additionally the P/M's job could be on the line by the manner in which he deals with the Congress.

One critic stated that the P/M can "tell them (Congress) what he wants them to know - up to a point." While this appeared to be true, the author does not consider this to be a major weakness in the system because it gives the P/M incentive and opportunity to exercise strong control over the potential problem. In the dynamic and ever changing acquisition environment many problems can be solved without the need of reporting them in the SAR. The author submits that reporting every potential problem on the SAR would be detrimental to effective project management for the following reason: The NMARC Report stated that currently the P/M denotes approximately 30% of his time to briefings, reviews and response to questions.[17] If he included every problem and potential problem the results would not only most likely be exceeding the 13 page size limit imposed on the SAR by DOD Instruction 7000.3, but more important it would cause a significant increase in the amount of time the P/M spends in "justifying his existence" because of increased program reviews, briefings, and correspondence.

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[17] NMARC Report, Volume II, Exhibit III-13.

The final point on this issue is that the P/M can carry his optimism only so far because of the effectiveness of the Congressional Committees in obtaining information on program status from other sources; therefore the P/M must be ready to justify his status during annual hearings. He can present his program on the "optimistic" side but must be prepared to justify his optimism.

V. ROLE OF THE SAR

A. GENERAL

The next area considered was the role of the SAR. The question used to trigger dialogue on this subject during interviews was:

"Do you think the SAR should give a financial statement or balance sheet type status of the project as of a date or should it be a forecasting document to predict future problem areas?"

As might be perceived by the reader familiar with the acquisition environment the answers were again biased depending on whether the interviewee was a user or producer of the SAR.

B. USER DESIRES

The Congressional Staff users were very polarized toward the latter concept. One stated that, "He wanted a document of about 5 pages in length that he could refer to and use for asking questions during annual hearings." He felt that the SAR should be a document that would highlight the problem areas in the program for the benefit of the Congress. He further expressed the view that the DOD was trying to hide information by not making the SAR that kind of document.

Berry and Peckham in their thesis concerning P/M dealings with the Congressional Committees made two

points relevant to the SAR.[18] First, the P/M is very vulnerable in front of the Congress. They found that a P/M could be "fired" if members of the Congress express their displeasure to the appropriate people.

Secondly, the Congressional Committees normally cut funds from programs rather than add to them. Therefore the implication is that the best the P/M can do as a result of his committee appearance is maintain the program and hope for no cuts. The rational P/M then could be expected to present his program only in the status that he can reasonably defend during hearings and not volunteer any potential problem areas that might cause controversey or give reason to reduce the program. The earlier discussion concerning the results of presenting minor problems and the devastating results in terms of intervention by middle and upper layers of management applies to this question.

C. ORIGINATORS CONCEPTS

On the other hand, the originators (P/M) felt that the SAR was similiar to a balance sheet which gave the status as of the end of a reporting period. The NMARC agreed with this philosophy. Of SAR it said:

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[18] Robt. C. Berry and Daniel E. Peckham, Interactions of Navy Program Managers with Congressional Committees and their Staffs, Monterey, Naval Postgraduate School, March 1975.

The reports are similiar in concept to the quarterly financial reports of the American Business Community to their stock holders and creditors.[19]

DOD Instruction 7000.3 states that the SARs are:

> . . . standard, comprehensive, summary Status Reports[20] on major defense systems for management within the Department of Defense.[21]

Since the instruction is vague on this point it appears to leave it to the discretion of the individual P/M.

One might argue that a comprehensive, summary status report should include every known and anticipated problem area. From a theoretical point of view there could be considerable support for such an idea. Unfortunately the political realities of the acquisition environment make such a practice not only difficult to police but completely impractical for the same reasons discussed in connection with DOD and Congressional involvement and the resulting demands on the P/M. Such involvement results in excessive time telling them what they want to know and it discourages initiative and imagination in terms of DOD Directive 5000.1 with regard to decentralizing authority and responsibility for the acquisition of a system.

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19 NMARC Report, Volume I, P. VII-58.

20 Emphasis Added.

21 DOD Instruction 7000.3 of 13 Sept 71, "Selected Acquisition Reports."

D. PITFALLS

While the Congressional Committee Staffs may promote the idea that "if you cleanse your soul and tell us all your problems we'll help you," the realities and their record of previous dealings with P/Ms have proven quite different as Peckham and Berry found.[22] The main method available to help the P/M involve the area of increasing appropriations. The record will show very few instances of that and many more examples of funding reductions; therefore the P/M would be expected to act in a manner which would provide the minimum number of problem areas to the Congress during discussions and SAR status reporting.

E. FINDINGS

Respondings to the Congressional user's desires in terms of format and content of the SAR might at first glance appear to be prudent. However, the author believes that the SAR's present role of informing the higher levels of DOD and Navy of the program's status is of vital importance. Therefore, the SAR should remain in its present format and intent. This idea was expressed by Secretary Packard in a letter 9 February, 1970, Letter to Senator Stennis where, in discussing the SAR, he stated, "Our objective has been to develop a report which fairly describes to key executives of the DOD and Congress the status of our acquisitions."

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[22] Berry and Peckham.

A good reason for retaining the present SAR role was expressed by a high ranking Navy Financial Management SAR Reviewer who stated that "since the inception of the SAR, appropriations sponsors and the OPNAV Staff are much better versed on the financial status of the program. Previously they got "up to speed" only at budget time and even then, some of them not so good."[23] He further indicated that the review process (which will be discussed later) and the very existence of the SAR have served to accomplish this increased awareness. The financial, technical, and schedule information in the SAR are all required to provide and retain this improved state of awareness. Based on this discussion and the political realities as earlier discussed, the author believes that the SAR should retain its current role, that of a balance sheet status report.

It has proven to be quite effective in helping all levels of the DOD to be better informed and thus provided the potential for more effective management. The question of whether or not the higher levels actually do a better job because of the information and data in the SAR is beyond the scope and time constraints of the authors' effort. It would, however, make an interesting and worthwhile future thesis topic.

While the author does not wish to prolong the behavorial aspects of the difference in concept of the

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[23] Name withheld.

role of the SAR which exists between the producer and the user, he would point out that these steadfast opposing views offer some insight into the criticism, dislike, and condemnation of the SAR by both groups.

VI. SAR REVIEW AND TIMELINESS

The next issue discussed during each interview was the SAR review process and the suggestion that the P/M submit the report directly to Congress. GAO recommended such a procedure in a recent report.

> It seems to us that with the emphasis the DOD has placed on assigning flag rank officers to manage major acquisition programs and with the increased emphasis in the past few years placed on developing rewarding careers in project management, it would be reasonable to expect the Project Officer to assume responsibility for the SAR content. We recommend that responsibility for the SAR preparation be delegated to a single individual in a responsible management position. The individual should be held responsible for the reasonableness, completeness, and accuracy of the SAR. Further, we recommend that the Project Officer (P/M)[24] be delegated this responsibility and that he certify as to the credibility of the SAR.[25]

The author was surprised to learn that the majority of the Project Managers interviewed stated that they preferred retaining the review system as it currently is. Their stated reasoning mainly centered on report standardization, the Review Committee catching errors, and matching the budget data with the FYDP, POM, and PDM Data. While proof could not be obtained, the author perceived that project personnel felt a certain protection or shield from pressure due to the fact that the Deputy Secretary of Defense currently releases the reports to Congress. If reporting requirements were revised to

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[24] Clarification added.

[25] Comptroller General of the U.S., p. 17.

make the P/M report directly to Congress this buffer would be removed.

A. RATIONALE

In considering the levels of review and the review process as it currently exists, the over-riding fact that must be remembered is that the acquisition team is a military organization and that the P/M is subordinate to the Chief of Naval Material, the CNO, and the DOD. To promote good order, discipline, and continuity the military chain of command must be preserved. Lest this sound like a "motherhood" statement, consider the impact and disorder that could and likely would occur if the P/M took every little problem to Congress. More specifically consider the consequences if for instance OPNAV or DOD wasn't giving the P/M all the support he desired because of the adverse impact the requested assets would have on other programs of equal priority. We have already seen that the P/M is rewarded for making his program succeed. If his parochial interest led him to reporting his dissatisfaction in the SAR directly to Congress and he gained Congressional support for the request DOD, OPNAV, NAVMAT, and the cognizant Systems Command would be forced to respond, probably at the expense of other important programs. Additionally the author perceives that the Congress does not desire the role of arbitrator to internal disagreements.

There is one Navy example of such direct dealing with the Congress. That is the Navy Nuclear Power Program headed by Admiral Rickover who is well known by the Congress and renowned for his direct dealings with them. While it would be difficult to fault the results of his program in terms of the hardware acquired and the management success acclaimed, the methodology has created a significant amount of stress within the Navy acquisition community.

The timeliness, or lack there of, in the SAR is directly related to the review process. SECNAV Instruction of 26 February 1972 is the Navy SAR implementing directive and gives insight into the review process. The schedule for review is included as Table I. The reason for the significant amount of time required for review (currently 50 days to Congress) is more easily appreciated when considering the levels of review, the detail review process, and the number of Navy programs currently on the SAR list; a total of 23 systems.

B. REVIEW TEAM

NAVCOMPT, OPNAV, and NAVMAT provided the members of the NAW SAR review team. This team met with each Project Manager commencing on the 19th day following the "as of date" (Table I). Since there was only one review team and certain members were required to review every major SAR system, the schedule during review week was very tight. The author learned that each program was alloted

REVIEW SCHEDULE FOR NAVY PROGRAMS

(1) Submit advance copies of Congressional (Group I) to CNO (OP - 902) no later than close of business on the 18th working day after the "as of date."

(2) Commence NAVCOMPT/OPNAV/CNM joint review of advance copies by 19th working day after "as of date."

(3) Upon completion of joint review, CNO (Program Sponsor) forwards comments to CNM (to include due date of original and final copies).

(4) NAVSYSCOMS/Project Managers correct/modify reports.

(5) Originals submitted to CNO via CNM as directed in (3) above.

(6) CNO submit originals to NAVCOMPT no later than 5 days prior to the due date in OSD.

(7) Secretariat submission to OSD in accordance with DOD Instruction 7000.3.

(8) Submit non-Congressional (Group II) advance copies no later than close of business on the 32nd working day after the "as of date."

(9) Commence NAVCOMPT/OPNAV/CNM joint review of advance copies by 33rd working day after "as of date."

(10) Submit final SARs to OSD no later than 45 days after the "as of date."

(11) ASD (Comptroller) distributes Navy SARs to Assistant Secretaries of Defense for I&l, DDR&E, PA&E, and Comptroller for review.

(12) 60 days after the "as of date" all final SARs to Congress.

TABLE I

1-2 hours for review. At the end of that time if issues remained that could not be resolved, they were coordinated and staffed with the project officer following the review week. The point was that the review team had to keep the review schedule going. The priority of the review process was to make sure that the SAR data were in agreement with other budget data such as the PDM, POM, and FYOP. The author was told that in all cases the Navy review coordinated changes with the P/M prior to executing them.

At DOD, the review process consisted of routing the SARs to those offices listed in Table I rather than forming a review team. If one of the offices disagreed with information in the SAR they submitted an "issue paper" to ASD (Comptroller) who was responsible for coordinating and staffing the correction or change. The ASD (Comptroller) Staff stated that all changes were coordinated with Navy reviewers and the cognizant P/M. Several project offices reported that this was not always the case and that changes had been made without the P/Ms knowledge. The author believes that such action was most unwise since the P/M must be able to defend the SAR during Congressional hearings and didn't always know the reason for the change.

The ultimate releasing authority is the Deputy Secretary of Defense who signs the SARs for transmittal to Congress. The author found that in the face of all the

emphasis on informing Congress via the SAR, only 12 copies of each was sent to "Capitol Hill."

C. FINDINGS

It is the author's opinion that a joint review process is essential to the SAR since the Secretary of Defense considers it to be the official DOD source for use as the basis for outside reporting on weapons system acquisition.[26] It is therefore important that SAR data matches other budget data. The offices represented on the review team are the agencies tasked with budget matters and have the best qualified people to insure agreement. A fall-out of this review process is some semblance of standardization among reports.

The fact that certain key individuals were required to review all Navy SARs was found to be a problem and one major cause of the length of the review period. While the author and several of the project personnel questioned had a personal distaste for a review of that length, the process does appear to be necessary in order to present a unified position to the Congress by insuring that budget documents and information reports are in agreement.

The fact that SAR submission to the Congress is untimely cannot be questioned; i.e., 60 days following the close of the quarter and approximately 5 months from the beginning of the reporting period. Assistant Secretary

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[26] DOD Cost Research Symposym Report, p.3.

of Defense (Comptroller) McClary in his 18 February 1975 memo to the various Assistant Secretaries of the Military Departments (FM) directed that the 31 march, 1975, SARs be submitted to OSD 35 days after the end of the reporting period.[27] This change is part of the effort to reduce the total submission time to the Congress. The current draft revision to DOD Instruction 7000.3 had not been published at this writing but it is anticipated that it will call for a total submission time of 50 days for Congressional SARs; down from the current 60 days. This appears to be no more than a token effort at reducing the submission time. As stated in the previous section the review process is necessary. The review queue is created by the requirement for a certain group of key people to review all programs. Since there are 23 Navy SAR programs and each may take up to 2 hours to review, the review team is physically time constrained as to the number of programs they can and must review. The problem is compounded at the OSD level where each ASD must review not only all the Navy programs, but also the Army and Air Force SARs in approximately one week.

D. RECOMMENDATION

The author suggests that if the delay in submitting the reports following the "as of" dates is severe enough

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[27] Unpublished ASD (Comptroller) Memorandum, 18 Feb. 1975, "Selected Acquisition Reports."

in the eyes of the Congressional user to warrant substantial change, an alternative approach would be to establish a "steady stream" type submission procedure. Under this concept each P/M would still report quarterly, but instead of having all reports submitted in a group at the end of the quarters, one or two programs per week would submit a SAR. For instance the F-14 and the DD-963 might report the first week, the Harpoon and the CVAN the second week, etc. This would remove the reviewing queue and reduce the delay in submission. It is estimated that the review period could be significantly reduced from its present nine weeks. The author believes that the total review could be completed and the report forwarded to Congress in as little as two-three weeks.

An associated finding dealt with the apparent use of the SAR. Almost universally, the interviewers stated that the SAR was not used to drive or make decisions. The author could only conclude that this implies the SAR was used for background information to complete the total picture of program status. Annually the GAO conducted a program review and submitted a report to the Congress. Additionally the Congressional Committee Staffs reported that they had "many contacts." They refused to identify the names or types of these contacts. Therefore the SAR appeared to be one of the key information sources concerning program status, but not the only one. This being the case, the actual arrival of the SAR would not seem

to be time critical except to insure that the current status was available for the annual hearings.

While this would be a significant change in terms of the traditional aspects of the SAR (i.e., conventional thinking associated with the end of the quarter, close of the fiscal year, etc.) the effect would be to relieve congestion at all levels; the reviewer, the producer, and the user levels. At the SAR producer level this would also relieve the pressure in the NAVAIR and NAVSEA cost divisions. As will be discussed later, the bulk of the cost data for most all major projects is originated and computed in one of these two centers.

At the user end of the pipeline, it seems unlikely to the author that the Congressional Committees are able to digest 50 SARs in a single group. This "steady stream" submission should not have any detrimental effect on Congressional Committee operations or hearings.

E. CONTINUOUS CHANGE

One serious problem area with the SAR system which was discovered was the continual change to the reporting procedures. In examining the policy changes recorded in one of the Project Offices it was observed that since the issuance of DOD Instruction 7000.3 in September, 1971 (ammended by change 1 in April 1972), reporting and format change memoranda have been issued on the average of once per quarter. The majority of these changes occured in the past year. Because of this, Project

financial personnel have waited till the quarter was completed before commencing their preparation of the SAR. This has been a problem in shortening the submission time but practically, it has been necessary because of the frequent changes. In one case as many as 4 change memoranda were issued to the Project Officer between the end of the reporting period and the date the SARs were finally submitted to the Congress! Each modified the guidance of the previous memorandum and two of these were dated just one day apart. In that instance, the final guidance, requiring another revision to the report was issued by the ASD (Comptroller) approximately two weeks after the reports were to have been due to the Congress.

F. ORIGIN OF CHANGES

Many changes are as a result of requests for a particular format or type information from the Congressional user. The P/Ms are aware of this. This knowledge plus the politically volatile nature of the SAR fed by all the pressure and interest from GAO and Congress has resulted in the P/Ms having a dislike for SAR preparation. Extreme displeasure results when the P/M has to resubmit due to a change in the reporting criteria. It has been recognized that the SAR system has been changed considerably and improved since its inception.[28] The author found that SAR improvement panels/committees had met in the

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[28] GAO Letter to Congressman Herbert, 30 Oct. 1973.

first three years of the life of the SAR and again in the Fall of 1974. Considerable effort was expended by these groups in gathering the inputs of all users, reviewers, and producers of the SAR concerning improvements to the system. The findings were examined by the ASD (Comptroller) and other DOD level reviewers and the applicable portions included in the subsequent instruction and policy revisions. However the continual changes to the rules had an adverse effect on the readability, continuity, and understanding of the SAR.

G. CONTINUITY

The NMARC panel recognized that refinements and guidance from higher authority will cause changes to the SAR format:

> However, the timing of such instructions has led to additional work (or rework) requirements on the Program Offices and the Navy Comptroller's Staff and have resulted in SAR submissions at dates later than desired. This problem is further compounded when one considers the impact on the reader of a report that is in a continual state of change. The continuity is broken, the ability to compare information (and the basis for its presentation)[29] from one report to another is hampered, and the creditability of the data is questioned.[30]

The author concurs and found that the problem of continuity was especially evident during the review of entire SAR files. Without the group of policy memos on SAR changes it was difficult if not impossible to trace

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[29] Amplification supplied.

[30] NMARC Report, Vol. I, p. VII-61.

cost data from one report to the next. Since many changes were made as a result of Congressional or GAO pressure, the author submits that the efforts of the Congressional user to change the report format for their benefit have only resulted in making the reports confusing. It should be noted that the draft revision to DOD Instruction 7000.3 was completed in November 1974; however since that time two change memos have been issued by the ASD (Comptroller). The latest one, issued on 7 March, 1975, will require another change to the 7000.3 draft revision. The coordination of all agencies required to "chop" this draft will result in further delays to the publication on the new DOD Instruction 7000.3.

The author strongly recommends that the Congress adopt a "hands off" policy to the SAR and let the system function to establish continuity and a baseline so that all concerned can develop an understanding of the system. The frustrations with the constant changes were best expressed as follows:

> Our point is that we would like to manage with the SAR as a useful tool rather than not manage by having lots of people changing the system all the time. They (P/M) get so concerned with that they never have time to manage.[31]

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[31] Unpublished Memo, Assistant Secretary of the Army (FM), 16 March, 1971.

VII. COST BASELINES

A. BACKGROUND

While the technical and schedule sections of the SAR provide valuable management information, there are few, if any, documents that evoke and arouse the emotions of the Congressional and DOD Resource Managers as does the cost section of the SAR. The author found a general disagreement of opinion on the value of point cost estimates. In general, it was observed that there was an overall lack of knowledge on cost estimation throughout DOD.

B. DEFINITIONS

For the SAR, the cost baseline is either the Planning Estimate (PE) or Development Estimate (DE) depending on the stage of the procurement. The definition of these two terms will be useful to the discussion:

Planning Estimate (PE). The estimates of operational technical characteristics, schedule and Program Acquisition Cost (for both development and procurement) when approval is given by the Secretary of Defense for program initiation. Normally, an approved Development Concept Paper (DCP) will be used as a source for the characteristics, schedule and cost estimates; however in the absence of a DCP, a Program Memorandum (PM), a Program Change Decision (PCD), Technical Development Plan (TDP) or some similar document may be sued. The specific source document will be identified in the report. The PE for procurement will be reported until the initial production contract is signed. Once a PE baseline is established it will not be changed unless specific permission is granted by the Assistant Secretary of Defense (Comptroller).

Development Estimate (DE). The estimates of operational/ technical characteristics, schedule and Program Acquisition

Cost for both development and procurement when approval is given by the Secretary of Defense for the program to move into full scale development. Normally an approved DCP will be used as a source for the characteristics, schedule, and cost estimates; however, in the absence of a DCP, another document may be used and should be identified in the report. Development estimate baseline figures for procurement may be revised when the initial production contract is signed and should include all anticipated options, follow-on effort, etc. Once a DE baseline is established it will not be changed unless specific permission is granted by ASD (Comptroller).[32]

C. DECISION POINTS

The decision points at which the Secretary of Defense gives approval for program initiation and full scale development are the DSARC I and DSARC II respectively. In questioning NAVCOMPT, ASD (PA&E) and project personnel the author obtained some interesting observations relating to the conflict and controversy surrounding cost baseline estimates.

First, the cost estimates used in DSARC reviews were normally derived from the DCP for the specific system. The DCP was originated by the military service concerned in draft for "comment" and "coordination" within OSD. The DCP, after "coordination," was carried to the DSARC and revised as necessary to reflect the modifications accomplished during the DSARC. It was then sent to the Secretary of Defense for signature at which point it consummated a decision. This same procedure now

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[32] DOD Instruction 7000.3.

applies at all three major decision points in a weapons systems' life.[33]

Interviewees described the actual mechanics of calculating a cost estimate to be one in which the P/M, with the assistance of the cognizant Systems Command Cost Analysis Branch, reviewed the contractor cost proposal and submitted his best estimate of the total cost for the system. The methodology universally used among the P/Ms was an engineering cost estimate where the work breakdown structure was analyzed down to Level 3.[34] Engineering cost estimating was found to be a very "soft" area. No Project Office questioned knew of any Navy or DOD Instruction covering this type of cost estimating. Essentially the P/M and SYSCOM cost shop were heavily reliant on the contractor's estimate. This estimate was presented in the DCP "draft" and, barring major difference from the estimates of the Independent Parameteric Cost Analysis Groups of OP-96D and OSD (PA&E), the P/Ms estimate emerged from the DSARC as the official forecast of system cost in the DCP. The mechanics of cost estimating was essentially the same at all decision points.

DOD Directive 5000.4 of 13 June 1973, established the Cost Analysis Improvement Group (CAIG). Their

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33 DOD Instruction 5000.2, 21 January 1975, "The Decision Coordinating Paper (DCP) and the Defense Systems Acquisition Review Council (DSARC).

34 DOD Instruction 7000.3.

operations have been primarily parameteric estimating during review and not the origination of cost estimates. This will be discussed later.

D. PROJECT DYNAMICS

The author has gone to some length to demonstrate how a PE or DE evolved. The reason was to show that considerable effort goes into developing such an estimate. There are two main problems associated with cost baselines.

First, all those interviewed agreed that accurate cost estimating is extremely difficult, especially in a major acquisition which may be six-ten years in length. That difficulty can be easily demonstrated by asking any home owner to compare the value of the home he paid $35,000 for five years ago with its current $60,00-70,000 price tag. Most weapons systems involve a degree of technical risk in advancing the "state of the art." Add that fact to the economic uncertainties of recent years and the job of accurate cost estimating for a ten year program becomes impossible.

A related problem involves the very nature of the evolution of a new system. The rapidly expanding technology in weaponry continually produces new capabilities. Many new subsystems can and do evolve during every phase of a system. These advances promise to improve its capability for countering the enemy threat. Ultimately, after some of these changes are incorporated and the PE or DE is revised to reflect the increased cost, the Congressional

Staffs have interpretated this growth in the price as "bad management."

The Congressional Staff attitude expressed to the author was one which almost completely ignored this dynamic nature of system evolution. Since actual systems cost nearly always exceed estimated cost, one Congressional Committee Staff member expressed his displeasure as follows: "He (the P/M) came here and asked for $2 million per copy for his new system five years ago when asking for approval; now today, he asks for $5 million per copy. Thats bad management no matter what the system does! You can't blame all that on inflation!"[35] The impact of inflation will be discussed later but here again was the wide conceptual gap in the users idea of what the SAR was giving and the producers thought on what he was submitting.

E. ESTIMATING DIFFERENCES

Secondly, the difference in estimating procedures caused problems. The P/M submitted an engineering cost estimate and the reviewing group used parametric estimating techniques. The author perceived that neither group understood the others estimating technique very well and were somewhat distrustful of the results. While the difference in techniques offered some check and balance they made it difficult to resolve differences in the estimates. It was discovered that in most cases, the P/M estimate

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[35] Name withheld.

had priority and was accepted unless an obvious discrepancy was discovered and could be proved to the reviewers without doubt.

F. MOTIVATION

The author would be remiss if he did not point out that there exists an excellent potential for contractor and P/M "optimism" also in this area. Again, pessimism on the part of the P/M would have resulted in added pressure and possible reductions to his program or even complete cancellation. Remembering that he (the P/M) was rewarded for "making the system work" and, further, that the contractor which fed him the data was rewarded by getting the contract, the potential for optimistic estimates was high. Due to the time constraints on this effort the author was not able to examine this question. The question of optimism on the part of the P/M and the contractor in cost estimates appears to be a fruitful area for future research. The author recommends that it be adopted as a thesis topic to determine if and to what extent the P/Ms and contractors submit "optimistic" cost baseline estimates either intentionally or due to improper techniques.

G. SUMMARY

The author found at all levels a lack of appreciation for the difficulty and importance of cost estimating. The NMARC Cost Panel concurred with this idea:

For Navy estimates of weapons system cost to become fully adequate and have the maximum credibility with DOD and Congress, the Navy, from the top down, must devote more attention, emphasis, education, and personnel resources to this subject in each of the SYSCOMs.[36]

This educational process must be extended on through DOD and to the Congress. As we saw from the Congressional Staff member comments and, as will be discussed later, they (the Congressional Staff) place extreme importance on the difference between the PE or DE and the current estimate of the total cost of a system. Their views express the opinion that the difference should be "zero!" The staff members have argued that both the PE and DE should be carried in the SAR through the complete acquisition. The author does not concur for these reasons:

1. There is apparent lack of understanding on the part of the Congressional Staffs as to the tentative nature of the planning estimate and dynamics of system evolution.
2. When both are displayed this would add to the size of the SAR and could give an inaccurate picture of the program by overemphasizing early changes. These early changes are typical, desirable and the very reason for having a conceptual phase - to refine the system.
3. It would be of little management or analytical value since comparing the production model of the system to the conceptual model since in most cases would be like comparing apples to oranges. In most cases they are two vastly different systems.

H. RECOMMENDATIONS

The cost baseline should continue in its current status; display the PE for those systems which are reported on prior to DSARC II and the DE only following

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[36] NMARC Report, Vol. I, p. VII-13.

DSARC II. A one time variance analysis should be provided for the SAR when the program changes from a PE to a DE. This would provide for tracing back to the projects conceptual phase for those who were interested.

Due to the dynamic nature of systems acquisition, a range cost estimate should be provided in the SAR rather than a point estimate. This would highlight the truly tenuous nature of cost estimating and relieve some of the pressure presently associated with "cost growth."

The DOD should launch an extensive program to educate the Congress and the Defense Acquisition Team of the nature, importance, and difficulty in accurate cost estimating and provide the Navy with the assets it needs to adequately staff their cost estimating organizations.

Since engineering cost estimates are so important in determining the cost baseline for the program, the author was concerned when no policy guidance on the subject could be uncovered. In essence, the only check on the P/Ms "best estimate": was the parameteric cost estimate. Although the author has no evidence that errors in engineering cost estimates have been the cause for "cost overruns," the potential for that type of situation certainly exists.

Some sort of policy or guidance concerning engineering cost estimates is needed. "Should Cost," which is a DOD engineering cost estimate offers one alternative to improve this

area. Should this be unsuccessful, firmer guidance in the form of a handbook or detailed instruction on engineering cost estimates would be a most unpleasant, but apparently necessary step. The author recognizes that this would be an extremely difficult and major step in dealing with contractors because the preparation of an engineering cost estimate is an internal procedure of great complexity. In considering this alternative, if the potential benefits outweigh the costs in terms of better estimates, reduced Congressional pressure on the P/M and DOD, and an enhanced defense management image, the handbook or instruction should be published.

ASD (I&L) Mendolia recognized the need for better cost estimating. In an article concerning procurement research he said:

> Perhaps the time has come for a quantum jump - to leap-frog the whole inventory of problems that bog down systems procurement today - to take the bold step of devising something completely new and different. Every time we advance the state of the art technically, yesterday's equipment becomes obsolete and the pricing experience becomes obsolete right along with it. We are continually gathering data banks on costs, but they are for yesterday's equipment. What we need is some way to forecast realistically what tomorrow's costs will be.[37]

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[37] Mendolia, Auther I., "How DOD's Procurement Insures Top Quality Technology," Commander's Digest, Volume 16, Number 19, November 1974.

VIII. CURRENT ESTIMATES AND VARIANCE ANALYSIS

A. GENERAL

One of the functions of a management information system is to compare what was planned with what has been achieved to date, with estimates for completion. In the case of complex weapons systems the schedule is fairly easy to track. The performance may or may not be easily verified depending on the nature of the procurement. For the area of cost, the SAR compares the Current Estimate (CE) to the PE or DE and establishes a variance analysis to provide some indication of the progress. While this appears to be a fairly straight forward process, the consideration of "what year" dollars, escalation, inflation, and which cost estimate to use quickly makes the cost analysis a most complex issue. For the purposes of comparison the SAR CE is defined as:

> Current Estimate. Enter the best current estimate of cost to buy the service inventory objective. These estimates will be based upon guidance given the Project Manager by the DOD Component Chief and Secretary of the DOD Component. They should be objective assessments of program costs. Any evidence of cost change must be indicated at the earliest possible date. If the DOD Component wishes, the CE may also be reflected in constant dollars, by footnote. All costs should be escalated in accordance with established policy on weapons system costing and inflation factors used to compute CE should be specifically identified.[38]

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[38] DOD Instruction 7000.3.

B. CE METHODOLOGY

The author found that most projects rely heavily on the appropriate SYSCOM Cost Group to either provide the basic data to the P/M and his staff or to check the data should the P/M opt to prepare his own figures.

To gain insight into the procedure of preparing the CE the author attempted to visit the NAVAIR Cost Shop. The reply was that they didn't have time. That being the case the conclusion that they were understaffed would be indicated. The author was allowed to review the cost worksheets for the December, 1974, SAR of a major NAVAIR Project. An informal survey of several other projects revealed that this example was typical of the methodology. Table II is a ficticious, hypothetical example of the worksheet that the Project Office would use. It is presented only to demonstrate the format and methodology. In compiling this worksheet the originator (NAVAIR Cost Shop) uses historical cost, existing contracts, contractor estimates, contractor labor agreements, learning curve effects, and all factors that are quantifiable. The ASD (Comptroller) issued the following guidance to the Service Secretaries concerning SAR cost estimates:

> The 'best estimate' should include not only economic factors but also production factors including the learning curve effect.[39]

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[39] Unpublished ASD (Comptroller) Memorandum, 18 June 1969, "Selected Acquisition Reports."

EXAMPLE
MISSILE COST ANALYSIS WORKSHEET

Manufacturer Bureaucracy Inc. Popular Name Paper Smasher Model SGM-9

Program Item	FY 1974 Unit Cost	Quantity 10 Total	FY 1975 Unit Cost	Quantity 10 Total	FY 1976 Unit Cost	Quantity 10 Total	TOTAL 74-76 Qty. 30
AIRFRAME/CFE	10	100	11	110	12	120	330
CHANGES	1	10	2	20	3	30	60
GUIDANCE	5	50	7	70	10	100	220
FLYAWAY COST	16	160	20	200	25	250	610
AVONICS SUPPORT		10		12		12	34
TECH DATA		5		4		3	12
OTHER		5		4		5	14
SUPPORT COST		20		20		20	60
GROSS P-1 COST		180		220		270	670
LESS PR. YR. ADV. PROC.		-10		-10		-15	-35
NET P-1 COST		170		190		265	635
SPARES		30		20		35	85
INVESTMENT COST		200		210		300	720
					TOTAL INVESTMENT COST		720

TABLE II

Their estimates are usually calculated in current year dollars and passed to the Project Office in a format similar to Table II with additional program item lines as appropriate. It should be emphasized that Table II is greatly simplified to facilitate its use as an example. The actual worksheet examined contained 25 Program Item lines over a 12 year period.

The P/M is then responsible to use these inputs and escalate and/or de-escalate the values to whatever base year is called for in the existing SAR submission policies. The base year for reporting purposes has varied from one reporting period to the next. Base years have included the current year and the year of program approval.

C. ESCALATION

Escalation factors are provided to the P/M by OSD.[40] Table III is the list of current escalation rates as specified by ASD (Comptroller) for the various categories of procurements. The appropriate economic factor is applied to total for each class of expenditures in a fiscal year. The historical and forecast expenditures by fiscal year are then totalled to arrive at the P/Ms "best estimate" for the total expenditure on the system.

One set of constraints on the cost section is that the P/Ms cost estimates must match the current years approved budget and the figures in the FYDP. The author

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[40] Unpublished Memo ASD (Comptroller), 18 February 1975, "Selected Acquisition Reports."

PRICE ESCALATION INDICIES
OASD (COMPTROLLER)

FISCAL YEAR	PROCUREMENT	RDT&E	SHIPBUILDING
1974	83.4	89.8	86.2
1975	100.0	100.0	100.0
1976	110.0	109.0	113.0
197	115.4	113.6	120.3
1977	120.4	118.3	127.4
1978	127.4	124.9	138.1
1979	132.5	130.1	147.2
1980	137.5	135.3	156.6
1981	142.7	140.7	166.7
Per Year Thereafter	3.8	4.0%	6.4%

SOURCE: ASD (Comptroller) Memorandum of 18 February 1975.

TABLE III

was told that considerable effort was expended during the SAR review process to insure that the SAR estimates did not conflict with either of the fore mentioned documents.

D. VARIANCE ANALYSIS

Variance analysis in the SAR is provided for all three major areas; schedule, performance, and cost. The first two areas require nothing more than brief statements concerning the difference between the CE and the DE or PE.

The program acquisition cost is quite a different story. DOD Instruction 7000.3 specified that cost should be identified separately for development, procurement, and construction. Additionally cost variance must be classified in terms of:

Quantity change
Engineering change
Support change
Schedule change
Unpredictable change (i.e., Act of God)
Economic change
Contract performance incentives
Contract cost overrun

The author will not discuss each class of variance due to the time constraints on this paper. They were presented only to give the reader a feel for the complexity the SAR has acquired since its inception. During the previously mentioned analysis of the SAR files of major programs the author had considerable difficulty in tracking differences from one quarter to the next. As an example, a number in the variance section would change. No supporting documentation or calculations were presented; only an explanation such as "change due to estimating refinement." After

reviewing a large number of SARs the author was not able to gather a great deal of meaningful information from this section in each SAR. A considerable number of the people interviewed felt that the variance analysis was one of the least useful sections of the SAR and none of them said that they used it. Currently the variance analysis may consume as much as 30-40% of the pages in a SAR. One SAR producer told me that he spends, by far, the largest amount of his time in SAR preparation balancing and correcting the numbers in the variance section. He felt that the data were not especially valuable and was somewhat frustrated by his perception of uselessness after so much work in preparation.

The current SARs are considerably larger and more complex than the first group of SARs submitted in 1969. The author had the opportunity to examine the packet of initial SARs that were sent to the Congress. Most averaged one-two pages total. In comparing the two generations of the SAR the immediate impression was that current SARs are far too complex.

E. RECOMMENDATION

The author believes that due to the difficulty in following program variance analysis and its apparent marginal usefulness the variance analysis sections of the SAR should be deleted. This would simplify the reports and improve the readability with little loss of ability to present the status of the program.

IX. ESCALATION AND COST GROWTH

A. GENERAL

The study of escalation and cost growth is extensive enough to provide the material for more than one thesis. The author was not able to investigate the subjects in detail and will only briefly introduce and discuss the problems to demonstrate how volatile the SAR becomes as a result of the differences of opinion on these two issues.

B. ESCALATION

As mentioned in the previous chapter the P/M applied the escalation factors supplied by the ASD (Comptroller) to the cost data breakdown by year to derive the total program cost. Obviously, the factors applied could change the total program cost by a significant amount. To emphasize this point during periods when actual inflation rates exceeded DOD projections a sensitivity analysis was added to the total program cost section of the SAR which provided a cost differential factor to add or subtract from the total program cost estimate to adjust for a different escalation rate.

An example of this type of impact was observed by the author during the SAR analysis phase of this research. A difference of only 2% in the escalation index resulted in a $50 million cost increment to acquire the target inventory for a system whose estimated total cost was

slightly in excess of $1 billion. It can be easily seen then that a small forecasting error during the unexpected "double digit inflation" of 1974 resulted in devastating growth to systems costs as will be discussed in the "Previous Rates" and "Impact of Realism" sections of this chapter.

C. INFLATION AND ESCALATION

Another "soft" area in the SAR was the entire concept of escalation and inflation. The enclosure to DOD Instruction 7000.3 (Paragraph II E3) seemed to imply that the two terms were interchangable. In discussing the procedures for computing the current estimate it said:

> All costs should be escalated in accordance with established policy on weapons system costing and inflation factors used to compute CE should be specifically identified.

During many of the interviews the author asked for an explanation of the difference of the two. Most interviewees stated that they didn't know what or if there was distinction. One felt that escalation could be divided into economic and non-economic escalation. Non-economic escalation was cost growth associated with items such as change orders and quantity adjustments. He stated that economic escalation was attributed to factors such as inflation or price index increases.

Another interviewee said that escalation was any cost growth. Inflation, in his view, was that portion of escalation due to the increase in price levels; i.e., the

change in the cost of a "standard market basket" of consumer goods or increase in some price index.

The author contends that the two terms are intended to be interchangable for the purposes of the SAR. In the SAR variance analysis, inflation was in the economic change category (page 69). However economic change in enclosure 1 to DOD 7000.3 (paragraph II G4) was defined:

> Economic Change. A change due to the operation of one or more factors of the economy. This includes specific contract changes related to economic escalation and the economic impact portion of quantity changes not accounted for by the original cost-quantity relationships used to calculate cost-quantity change variance. Constant or current dollar amounts in program estimates to reflect (1) altered price levels and (2) definitized contract amounts.

This subject provides another fruitful thesis research area. The author was time limited but felt that a brief introduction would be beneficial in highlighting the lack of understanding in this area during economic fluctuations. Inflation has been such a provocative and emotional subject that no matter how it was handled in the SAR or any other reporting system there would be controversy generated over the methodology and results. The SAR users (Congressional Committees) have been particularly critical of inflation in the SAR. They felt the P/M was trying to blame all cost growth on inflation. The staffs felt that inflation was not solely to blame. Since the exact inflation impact could not be identified in the SAR, the staff members were very suspicious of the validity of the cost data.

While the author could obtain no direct evidence, there was a strong presumption that this suspicion on the part of the Congressional Staffs led to pressure on DOD which culminated in the 7 March 1975, ASD Comptroller Memorandum requiring two SAR cost formats. One estimate will be in current year dollars. The other in base year dollars; with the base year, in most cases, the year the project was first authorized. The apparent intent was that, if the P/M de-escalates all costs (including the CE) back to the base year, the difference between the DE and CE in those same year dollars would be the actual cost growth not attributable to inflation. While on the surface the concept seems to be sound, the familiar questions of - in what year dollars do you price a contract change, what deflation factors whould be used, and which cost baseline again become extremely important. As we will see in the next few sections of this chapter, the compounding effects of a small escalation/de-escalation rate difference lead to significant dollar differences over the 8-15 life span of most SAR projects. The author questions whether any meaningful data will be produced with the two formats. A phone check with two Project Offices during the final stages of the writing of this thesis has revealed that there is considerable disagreement over the above questions.

Further, an extraordinary amount of time has gone into the preparation of the extra format. The concept of the cost and value of information should be considered. The

author recommends a study to evaluate the use and worth of this information. It is possible that the Congressional Committee Staffs, in an attempt to fulfill their percieved role of reducing budget requests to give the illusion of control (Berry and Peckham, p.57), have gone too far in reviewing past data attempting to highlight "bad management." While those historical data are valuable in making program decisions, the main emphasis in program management and review should be the future or completion of the project. If the decision is reached to continue a program the efforts should be concentrated on optimizing the remainder of the program rather than focusing on the historical data. Historical data should be a means and not an end.

D. CONTRACTOR ESTIMATES

Several project personnel were questioned as to whether or not they felt the contractor was "inflating" the cost estimates he provided. The majority response indicated they didn't know or weren't sure. This area was one in which the author recommends immediate investigation. If the contractor is "inflating" his cost estimates for future portions of the program and the P/M later applies an escalation factor the resulting cost estimate is in error.

E. PREVIOUS RATES

Prior to the June 1974 SARs the maximum escalation rate permitted by DOD was 4.5% annually. The 4.5% rate

was for FY 1975 followed by 3.1% for FY 1976 and beyond. These indices were maintained despite the fact that the economy as a whole was experiencing an inflation rate far in excess of that. For example:

> In December (1974) the all commodities WPI (Wholesale Price Index) was at 171.5, 20.9% higher than a year earlier.[41]*

> In December (1973), the all commodities WPI was 145.3, 18.2% higher than it was a year earlier.[42]

> The September (1974) CPI (Consumer Price Index) was 12.1% higher than a year ago.[43]

These factors were well above authorized DOD estimates. As an example the WPI index for the base year of 1967 provided an index value of 100. When the author compared the 1974 WPI index number 171.5 with a standard escalation/de-escalation chart provided as Table IV for a 7 year period (1967-1974) the average escalation rate factor was 8%; approximately two to three times what had been used in previous SAR cost estimates. Even using the CPI number 151.9 from Table V gives an average yearly escalation rate above 6%.

The author intends to merely introduce this subject but as can be readily seen it provides a fruitful area for further research into its application to the SAR.

41* Emphasis added. U.S. Department of Labor, "Wholesale Prices and Price Indexes," December 1974, P. 1.

42 U.S. Department of Labor, "Wholesale Prices and Price Indexes," December, 1973, P. 1.

43 U.S. Department of Labor, "Consumer Price Index Detailed Report," September 1974, P. 1.

YRS	ESC/DESC FACTOR														
	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
-10	0.7441	0.7089	0.6756	0.6439	0.6139	0.5854	0.5584	0.5327	0.5083	0.4852	0.4632	0.4423	0.4224	0.4035	0.3855
- 9	0.7664	0.7337	0.7026	0.6729	0.6446	0.6176	0.5919	0.5674	0.5439	0.5216	0.5002	0.4799	0.4604	0.4418	0.4241
- 8	0.7894	0.7594	0.7307	0.7032	0.6768	0.6516	0.6274	0.6042	0.5820	0.5607	0.5403	0.5207	0.5019	0.4838	0.4665
- 7	0.8131	0.7860	0.7599	0.7348	0.7107	0.6874	0.6651	0.6435	0.6227	0.6028	0.5835	0.5649	0.5470	0.5298	0.5132
- 6	0.8375	0.8135	0.7903	0.7679	0.7462	0.7252	0.7050	0.6853	0.6663	0.6480	0.6302	0.6129	0.5963	0.5801	0.5645
- 5	0.8626	0.8420	0.8219	0.8025	0.7835	0.7651	0.7473	0.7299	0.7130	0.6966	0.6806	0 6650	0.6499	0.6352	0.6209
- 4	0.8885	0.8714	0.8548	0.8386	0.8227	0.8072	0.7921	0.7773	0.7629	0.7488	0.7350	0.7216	0.7084	0.6956	0.6830
- 3	0.9151	0.9019	0.8890	0.8763	0.8638	0.8516	0.8396	0.8278	0.8163	0.8050	0.7938	0.7829	0.7722	0.7617	0.7513
- 2	0.9426	0.9335	0.9246	0.9157	0.9070	0.8985	0.8900	0.8817	0.8734	0.8653	0.8573	0.8495	0.8417	0.8340	0.8264
- 1	0.9709	0.9662	0.9615	0.9569	0.9524	0.9479	0.9434	0.9390	0.9346	0.9302	0.9259	0.9217	0.9174	0.9132	0.9091
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	1.0330	1.0350	1.0400	1.0450	1.0500	1.0550	1.0600	1.0650	1.0700	1.0750	1.0800	1.0850	1.0900	1.0950	1.1000
2	1.0609	1.0712	1.0816	1.0920	1.1025	1.1130	1.1236	1.1342	1.1449	1.1556	1.1664	1.1772	1.1881	1.1990	1.2100
3.	1.0927	1.1087	1.1249	1.1412	1.1576	1.1742	1.1910	1.2079	1.2250	1.2423	1.2597	1.2773	1.2950	1.3129	1.3310
4	1.1255	1.1475	1.1699	1.1925	1.2155	1.2388	1.2625	1.2865	1.3108	1.3355	1.3605	1.3859	1.4116	1.4377	1.4641
5	1.1593	1.1877	1.2167	1.2462	1.2763	1.3070	1.3382	1.3701	1.4026	1.4356	1.4693	1.5037	1.5386	1.5742	1.6105
6	1.1941	1.2293	1.2653	1.3023	1.3401	1.3788	1.4185	1.4591	1.5007	1.5433	1.5869	1.6315	1.6771	1.7238	1.7716
7	1.2299	1.2723	1.3159	1.3609	1.4071	1.4547	1.5036	1.5540	1.6058	1.6590	1.7138	1.7701	1.8280	1.8876	1.9487
8	1.2668	1.3168	1.3686	1.4221	1.4775	1.5347	1.5938	1.6550	1.7182	1.7835	1.8509	1.9206	1.9926	2.0669	2.1436
9	1.3048	1.3629	1.4233	1.4861	1.5513	1.6191	1.6895	1.7626	1.8385	1.9172	1.9990	2.0839	2.1719	2.2632	2.3579
10	1.3439	1.4106	1.4802	1.5530	1.6289	1.7081	1.7908	1.8771	1.9672	2.0610	2.1589	2.2610	2.3674	2.4782	2.5937
11	1.3842	1.4600	1.5395	1.6229	1.7103	1.8021	1.8983	1.9992	2.1049	2.2156	2.3316	2.4532	2.5804	2.7157	2.8531
12	1.4258	1.5111	1.6010	1.6959	1.7959	1.9012	2.0122	2.1291	2.2522	2.3818	2.5182	2.6617	2.8127	2.9715	3.1384
13	1.4685	1.5640	1.6651	1.7722	1.8856	2.0058	2.1329	2.2675	2.4098	2.5604	2.7196	2.8879	3.0658	3.2537	3.4523
14	1.5126	1.6187	1.7317	1.8519	1.9799	2.1161	2.2609	2.4149	2.5785	2.7524	2.9372	3.1334	3.3417	3.3629	3.7975
15	1.5580	1.6753	1.8009	1.9353	2.0789	2.2325	2.3966	2.5718	2.7590	2.9589	3.1722	2.2997	2.6425	3.9013	4.1772

Table IV. Escalation Values

	1967	1974
GNP DEFLATOR (1958=100)	117.6[44]	172.1[45]
WPI (1967=100)	100	171.5
CPI (1967=100)	100	151.9

INFLATION INDICIES 1967-1974

TABLE V

A thorough investigation of this aspect of the SAR system, while eminently worthwhile, is beyond the scope of this study.

The reason for these lower rates of escalation could not be actually determined and can only be speculated upon by the author. It appeared to be a political constraint imposed for the reason that a major government agency, such as DOD, could not be permitted to forecast higher rates of inflation without the prospect of contractors, labor unions, and others responding in such a way as to making them come to pass. While this may have proved politically expedient the result was an extraordinary increase in cost estimates when more realistic values

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[44] U.S. Department of Commerce, Statistical Abstract of the U.S., 1974, p. 404.

[45] U.S. Department of Commerce, "Survey of Current Business," Vol. 54 #12, December 1974, p. s-2.

were used. The large cost growths associated with such reassessment resulted in an outcry from the Congress.

F. IMPACT OF REALISM

When more realistic rates were applied such as 11% for FY 1975, 8% in 1976, decreasing to 4.3% in 1980 and 3.7% annually thereafter, the grand total cost estimate for 44 major DOD acquisitions rose to a total of $16.9 billion; from approximately $90 billion to $106 billion. Of that increase Navy programs were responsible for $7.3 billion from a baseline of $50 billion. In commenting on the increases ASD (PA&E) Sullivan re-affirmed his opinion of the lack of understanding on Capitol Hill as to the tentative nature of cost estimates. He forecast that the Pentagon will "be told by some members of Congress that that's how bad we managed between the first and second quarters."[46] His prophesy was born out as evidenced by the increased number of inquiries by Congressmen, Senators, and their staffs. A SAR Improvement Group was established within DOD to try to ease some of the pressure. The GAO conducted another study of the SAR. Since that time several new change memoranda for DOD Instruction 7000.3 have emerged. A draft revision to the same instruction is currently in routing for coordination and publication. While it would be difficult to tie each of these directly

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[46] "Aerospace Daily," Vol. 69 #22, 2 October 1974, p. 169.

to the revised escalation indices the fact remains that they followed shortly after the public announcement concerning the new cost estimates.

Although the rates indicated in Table III may have come close to what actually happened for what is now known of the 1974-1975 period, the reader might challenge the rates indicated for future years. Speculation about the political constraints, again in terms of limiting those indicies, could be well founded. The political problem of DOD "officially" embracing future inflation rates considerably higher than those then being experienced was a very sticky one. More significant was the economic uncertainty in general. That subject will be discussed in the succeeding chapter.

G. COST GROWTH

Cost growth, in simple arithmetic terms, was the difference between the current estimate and the baseline estimate. As has been previously discussed, both elements of the cost growth equation (CE and DE) were very "soft" and subject to ranges depending on what escalation indicies were used. The engineering cost estimating problems increase the uncertainty as to what the actual cost growth was.

This cost growth was also extremely difficult to trace from one quarterly report to the next because of the rapidly changing format and guidance in computing estimates. Many readers of the SAR were not on the routing for new

change memoranda issued by ASD (Comptroller) and therefore had no knowledge of the many changes. As the author found during his own investigation, without the current guidance and all the changes in between, it was nearly impossible to refer to DOD Instruction 7000.3 and trace the cost growth.

In essence, then, the current guidance had a significant impact on the current cost status of the program in the SAR. The total program cost estimate could vary over a wide range, depending on the projected escalation. Due to the dynamic nature of weapons system evolution, the baseline, in many cases, was not an accurate reflection of the true system capabilities and components. As we saw, during development it was subject to many changes. This is not to say that it shouldn't have changed, merely that it did and this made it extremely difficult to put "handles" on the process with which the Congress could evaluate the P/M and his management performance.

X. ENVIRONMENT

A brief description of the environment in which the SAR and the P/M must live and function would be beneficial to the reader prior to summarizing the findings.

A. CONGRESS

The U.S. budget in the past several years has undergone a transition in that Defense no longer gets the largest share of the annual budget. "In the current Federal budget 70% of the dollar expenditures are uncontrollable."[47] Most Defense acquisitions fall into the 30% that is controllable. Since considerable Congressional review occurs prior to appropriating these monies, the SAR has emerged as a primary information tool to transmit the status of particular programs to the Congress. Berry and Peckham reported that the Congress sees their role as one of cutting the funds requested for some programs to ensure that the illusion of control is projected. In this light many Congressionally Requested Changes to the SAR format and content appear designed to make spotting problems and cost growth easier. This was the apparent motive behind the 7 March 1975 ASD (Comptroller) change memorandum to the SAR which called for de-escalating all costs and estimates back to the program base year. They felt

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[47] Unpublished speech by Senator Barry Goldwater, 11 April 1975 to the National Student Symposium on the Study of the Presidency.

that then the Current Estimates could be compared to Development Estimates or Planning Estimates in the same year dollars for a simple calculation of cost growth. The Congressional proponents of this methodology base their analysis and program evaluation on two estimates. They had little appreciation for the tentative nature of those estimates or the dynamics of project evolution. As was previously shown, the planning (escalation) factors determined to a large extent the cost estimate for completion of the program.

B. CONTRACTORS

The contractors in many defense industries are no longer as dependent on DOD business as they once were. This is especially true in the Navy's unique area of shipbuilding. The past ten years has seen a significant decline in the number of American shipbuilders. The shipbuilding industry has long suffered the inefficiencies associated with the complexity of constructing a state of the art "man-of-war." The shipyards currently have a large backlog of orders for oil tankers and ore carriers. These vessels are much less complicated to build than combatant ships. Additionally, commercial business does not commit the contractor to costly and complicated management assistance programs such as Government Quality Assurance, Military Standards/Specifications, and CSCSC (DOD Instruction 7000.2 series). Consequently the Navy

is having difficulty in obtaining competition for some of its major contractors. In this less than competitive environment there is not as much motivation for accurate cost estimates; especially in the cost-plus type contracting situation. There are special problems in shipbuilding that do not exist in the aircraft or missile programs. Foremost is the time element. The complexity in shipbuilding would make cost estimating most difficult in a "sterile" environment free from inflation over a 10-15 year period required for completion. It is impossible when a new shipbuilding program pushes the state of the art. Add to that the violent economic conditions of the past two years coupled with shortages of basic raw materials and the ever escalating demands by labor and the contractors, and a point estimate of what the Number 7 Trident Submarine will cost 6-8 years from now is very "soft." These appear to be the ingredients for guaranteed cost growth.

C. CORPORATE PLANNING

To amplify the plight of the P/M in dealing with the contractor during periods of economic uncertainty, major changes have apparently transpired in the past year, especially in the area of long range corporate planning. Many major companies (including some major defense contractors) have forecast continuing high inflation (contrary to ASD (Comptroller) guidance), continuing tight money, and high long term interest rates. Some are

revising their planning to include the "worst case" which in certain instances is a full depression. This has been difficult due to the opposing, long standing traditional economic model built on a straight course of optimism. Several quotes from a recent special report on this subject are worth reviewing:

> As risks mount, companies routinely demand of their businesses a higher return on investment.
>
> In line with trying to reduce the risk exposure in the company, and at the same time not lose any of the entreprenenrship, we (General Electric, a major DOD contractor) have moved toward more organically grown, smaller-in-size, larger-in-number ventures.
>
> Just predicting the future worth of the dollar is a major planning headache. American Standard (Corporation) encourages managers to translate dollars in forward plans into ounces of gold, not only to keep them aware of the continuing erosion of the dollar but to dramatize the need to look at market forecasts in terms of physical units rather than paper money, which overstates market growth.[48]

These quotes were mentioned to emphasize the wide span between the Government and the business world on views of the future.

D. GOVERNMENT PLANNING

The DOD guidance on economic escalation of 3.1% beyond 1980 couldn't be classified as "continuing high inflation." The concept of "smaller-in-size, larger-in-number" ventures can't refer to major acquisition programs; which means General Electric may become less interested in

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[48] "Corporate Planning-Piercing Future Fog in the Executive Suite," Business Week, 28 April 1975, p. 54.

DOD contracts. The Armed Services Procurement Regulation (ASPR) and the Report of the Commission on Government Procurement have indicated a trend for placing more, not less, risk on the contractor. As for the contractors higher return on investment, the audit agencies of each service, the DOD, and the GAO are all growing in size and importance. They carefully review contractor records to verify all cost data. There is a contract renegotiation board to ensure that a contractor's profits are not excessive.

E. ESTIMATE OF SAR IMPACT

What is the impact in Congress when a program reports a significant cost growth in its SAR? While no firm data could be gathered on this question, the discussion was deferred to this section because the environment has a significant impact on the author's answer to this question.

First, the SAR is not a decision making document. The interviewees almost unanimously agreed that no decisions are made based on the information in the SAR. The reasons cited were that the SAR was not timely enough and that the PPBS system plus the annual budget hearings provide the procedures for the majority of the decisions concerning a program. Remembering that the SAR's mission was to inform, the purpose of reporting cost growth would merely be to highlight this information to the Congress.

The recent course of events when a program suffers cost growth has been to reduce the numbers of the system bought and/or lengthen the program cycle in hopes of later approval of additional funds. It would be difficult to forecast that pattern changing, unless it became more restrictive!

F. OUTLOOK FOR THE SAR

In the midst of these problem areas, the P/M will be under more pressure than ever to reduce cost growth and control cost. The SAR will become more prominent as the Congress and its Committees expand their base of direct control over the procurement team. The author sadly forecasts more, not fewer, changes to the SAR format and reporting procedures as the Congress strives to gain the information they perceive is required to exercise this control.

Until improved appreciation is gained at all levels of the tenuous nature and difficulty of accurate cost estimating for a ten year program in an uncertain environment the SAR will continue to exist in a cloud of controversy and continual change.

XI. FINDINGS AND CONCLUSIONS

A. FINDINGS

The author found that there was considerable disagreement on a number of the issues including the role of the SAR, the review process, the question of accurate status reporting, and the definitions of escalation and inflation. In general there was little appreciation at the user level for either the dynamic nature of a major acquisition or the tenuous nature and difficulty of point cost estimates.

The queue for the review process was created by the fact that a small group of people essentially review all Navy SARs; they are physically time constrained from speeding the process to any great degree. An associated problem was the frequently changed reporting guidance which constrained the P/M to waiting until the "as of date" to commence SAR preparation thus contributing to the length of the review process. The SARs are untimely in terms of their arrival at the Congress. This appeared not to be a significant factor since it was discovered that the SAR does not drive any program decisions.

At the P/M level, the incentive for "optimism" exists in terms of career rewards. Very few projects present their status as "complete optimism"; i.e., only minor or no problems. The P/M used engineering cost estimating

techniques for calculating baseline cost estimates. Slight differences in escalation rates used for cost estimating could produce large changes in the estimated price for most systems. Until recently, unrealistic escalation rates produced unrealistic low estimates. More significant was the large impact of applying more realistic escalation rates to program costs. In general, the P/M and his staff had a dislike for the SAR due to the large amount of time required to prepare, review, revise, and answer questions concerning the SAR.

Overall, the SAR has changed considerably since its inception. The original Congressional SARs were a maximum of two pages each. Now the SAR has grown so much that a 13 page limit was imposed. It has also increased in complexity and now includes cost, schedule, and performance data plus a variance analysis and contractor information sections.

B. CONCLUSIONS

The author concluded that, due to the problems of varying escalation rates, which compound cost growth, questionable cost estimates, and the dynamic nature of system evolution, the SAR was only reasonably effective in accurately presenting the cost status of a project. The amount of review seemed to insure that it was accurate for the present but that it may not show all the problems. In general, the performance and schedule information was accurate.

There is considerable room for improvement of the SAR system, especially, in terms of cost estimating and its understanding, SAR timeliness, frequency of revision of reporting guidance, variance analysis, and overall complexity. The succeeding section will list some specific recommendations for improvement.

The area of cost data computation was a very "soft" one. Since cost data for the SARs were computed or monitored by the appropriate SYSCOM cost shop, there should be firm guidance in terms of standardized estimating procedures.

The SARs arrival at their ultimate user, the Congress, could not be termed timely (60 days following "as of" date). This issue was tied directly to the review process. The author concluded that it would be very difficult to expedite SAR submission under the current practice of submitting them in a group.

The review process was needed to provide some degree of standardization among programs and ensure that SAR data were in agreement with FYDP and budget data. In addition, without the file of change memoranda it was difficult if not impossible to track changes in the SARs of any program.

The author concluded that the SAR should retain its present role of providing the status as of a date rather rather than being an expanded "program highlights" document only, highlighting problem areas. This was

based on the important function the SAR was filling; providing high ranking Navy and DOD officials with data necessary to improve management of the several programs. That is not to say that major problems should not be noted in the SAR; however the inclusion of every potential problem would introduce many middle layers of management and suppress P/M initiative and aggressive management techniques.

In the same light, the P/M should not report directly to Congress with the SAR. The fact that the procurement team is a military organization makes it necessary that the superiors of the P/M (Navy and DOD) review the inputs to ensure concurrence with budget data and the established priorities of the entire Defense establishment.

The author concluded that point cost estimates are almost worthless in the uncertain economic conditions, long lived programs, and the rapidly changing inflation that have recently been experienced.

Overall the author believes the SAR is too complex and time consuming in its preparation. The author concluded that the concept of the SAR or any similar information document is a sound one; however, the SAR user must recognize the inherent limitations on comparing two estimates to provide an exact measure of cost growth and management evaluation. The author concluded that the economic uncertainties and technological advances during a long term major acquisition will result in changes and

cost growth. Attention should be focused on those decisions concerning the future of the program. Since the magnitudes of the estimate to complete is a direct function of the escalation indicies the author would be most interested in the rates the Congress would recommend for use.

The NPS Library needs to be expanded to include more procurement literature since the System Acquisition Curriculum has received more attention and interest at high levels. Specifically the "Aerospace Daily" Newspaper should be ordered. Most important is an updated file of DOD and Navy Instructions which are invaluable reference material for student research.

Many of the areas examined and some of those not examined in this thesis require further research. Specific recommendations are included in the succeeding chapter.

XII. RECOMMENDATIONS

1. The SAR should retain its current role; an "as of date" status and not strictly a problem highlights document.
2. The P/M should not report directly to Congress with the SAR. The concept of review should be retained to ensure POM, PDM, FYDP, and budget data are in agreement.
3. The Congress should consider the issue of SAR timeliness. If the current system is unsatisfactory due to late SAR arrival the alternative of "steady stream" submission is recommended. This would still involve quarterly reporting for all projects but instead of submitting at the quarters end, approximately two reports per week would be submitted and reviewed.
4. The Congress should develop a "hands-off" policy with respect to the SAR. The continual requests to DOD for SAR format and content changes has destroyed the continuity in the reports, made them difficult to prepare and read. Specifically the 7 March 1975 ASD (Comptroller) Memorandum requiring two cost sections should be rescinded immediately; one cost section is sufficient. Continued attempts to make the SAR "all things to all men" by continual changes will result in it "being nothing to everyone."

5. The Congress should educate itself on the tenuous nature and uncertainty in cost estimates. To that end it is recommended that a cost range not a point estimate be included in the SAR.

6. The Navy and DOD should consider some policy or guidance concerning engineering cost estimates. An expanded "Should-Cost" program offers one alternative to improving this area. Another, and more drastic option, would be a detailed instruction or handbook on engineering cost estimating. Either would be a major departure from current practices.

7. Research is recommended in the following SAR or SAR related areas:

    Effects of P/M rotations on SAR reporting.

    To what extent do the P/M and contractors submit "optimistic" cost baseline estimates either intentionally or due to improper techniques?

    Do contractors include inflation in their cost estimates which are in turn escalated by the P/M - in effect compounding the inflation?

    What inflation/escalation rates should be used for future predictions?

    What are the definitions and proper uses of inflation and escalation?

8. Only one cost baseline estimate should be carried in the SAR; the PE prior to DSARC II (if applicable) then the DE following DSARC II. A one time change analysis

should be included to explain the difference between the two.

9. The detailed variance analysis sections of the SAR should be eliminated to enhance the readability and understanding of the report while reducing its complexity.

10. DOD should not restrict the SAR producer to an escalation rate 1/3 to 1/2 of what the current economic inflation rate is demonstrating. This results in unrealistic cost estimates and increased pressure when the realistic indicies are applied.

11. To enhance the understanding of the SAR, ASD (Comptroller) should revise DOD 7000.3 for each change of the reporting criteria rather than sending memoranda to the service secretaries.

12. The NPS Library should be funded for additional support to the SAM student. In particular, "Aerospace Daily" and current files of DOD and Navy Instructions should be maintained for more effective support of student research. This is especially true in an era of reduced travel funding.

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