Knowing the final cost of the RCOH is important, but it is more important to understand why cost increases occurred and how the overall planning and execution processes can be improved. In this chapter, we try to evaluate how well the planning, contracting, and execution processes worked in the CVN 68 RCOH and how they might be improved. We use several criteria that have proved useful in analyzing the management practices in other DoD programs.¹ These criteria cover the basic functions and characteristics of the various organizations involved in the decisionmaking processes of program management:

1. **Clear and effective lines of authority have been established.** Are the roles and responsibilities clear to all and observed and effective in the course of work?

2. **Communication is encouraged.** Is communication among all those in the project free and effective both vertically and horizontally?

3. **Cost, schedule, and change-control methods are used.** Is an effective cost, schedule, and change-control methodology established,

¹The criteria are taken from Robert Johnson and John Birkler, *Three Programs and Ten Criteria: Evaluating and Improving Acquisition Program Management and Oversight Processes Within the Department of Defense*, RAND, MR-758-OSD, 1996. That report addressed three aircraft acquisition programs. The criteria have been adapted to the RCOH environment.
used by all concerned, and effective for managing the program without undue interference?

4. *A risk-management process is used.* Is an effective process in place for testing and managing risks?

5. *Requirements and work-package definition are clear and sound.* Is the work to be done defined clearly and can it be executed within the resources available?

6. *Cost estimates are well defined and justified.* Is cost estimating well grounded in past data? Are estimates accurate? And is the cost information effective at justifying the expenditure of funds as planned?

7. *Incentives are apparent and appropriate.* Are there effective incentives for encouraging good performance at all levels?

8. *Funding is adequate and stable, and control and support are ensured.* Is sufficient funding available for the planned work? And is there support up the funding chain for obtaining adjustments if needed?

9. *The management team is selected for credibility and stability and is of adequate size.* Is the management team adequately experienced and trained in the tasks expected of it? Is it stable over the duration of the program? And are there enough personnel to get the work done?

For each criterion, we defined three levels of achievement: “Good” means that the program practices were sound and there was little or no need for improvement. “Needs improvement” means that the basic structure of the program was acceptable, but the practices had room for improvement. “Needs Senior Management Attention/Action” means that there were serious deficiencies in program structure and practices, and senior management should make some basic changes for future RCOHs.

We elaborated on the definition of each achievement level in a manner specific to each criterion. As an example, Table 5.1 (p. 54) shows the attributes and characteristics required for each achievement level for the lines-of-authority criterion.
We used this structured program-management assessment framework in interviews with the major organizations involved in the RCOH planning and execution processes. We interviewed individuals at the PEO level, in PMS 312 and its various organizations, at both Naval Aviation, Pacific Fleet (AIRPAC) and Naval Aviation, Atlantic Fleet (Airlant), in the various codes at SUPSHIP NN, and on the ship. We also interviewed various individuals at NNS who were involved with the RCOH. The intent was to be informative about the CVN 68 RCOH processes, not to be critical of any person or organization. We asked about the criteria within each organization and between various organizations, including interactions between the Navy and NNS.

In this chapter, we distill what we heard during these interviews. Each criterion is broad enough that in discussions with persons from different organizations, we encountered different interpretations and emphases. There is also some inherent overlap among the criteria, especially in the interrelationships that contribute to cause and effect. At times, we heard conflicting judgments or assessments about process performance, potential problems, and possible solutions. We have tried to sort through everything we were told in the interviews so that we might paint a clear and unbiased picture of process performance.

Although we concentrate on the problems and shortfalls in the planning and execution of the CVN 68 RCOH, this does not imply that nothing was done correctly. The planning and execution processes had many very good aspects, especially considering the complexity of the project and the fact that it was the first RCOH for the Nimitz class. Also, some of the problems were corrected or improved upon over the course of the RCOH. The various Navy organizations and NNS recognized difficulties and took corrective actions, especially for the planning of the CVN 69 and 70 RCOHs.

In what follows, then, it must be remembered that the end result was successful. The RCOH has provided the USS Nimitz with a sound foundation for the next 23 or more years of her operational life. It is possible, however, that the same result might have been achieved in less time or for less money. It is also possible that in the same time and for the same money, even more might have been achieved. Identifying process improvements that might have allowed such en-
hanced outcomes will be especially important for subsequent RCOHs, which are budgeted at lower levels. We hope that the insights and suggestions in this chapter will allow even greater improvements in the RCOH process.

CRITERION 1: LINES OF AUTHORITY

The lines-of-authority criterion addresses the overall organizational structure for the planning and execution phases of the RCOH (Table 5.1). It focuses on the decisionmaking chain of command, including responsibilities, relationships, and coordination, between and among the various organizations. It considers whether or not the organizational processes, not the specific people within the organization, are effective in the planning and execution of the RCOH.

We found that for the CVN 68 RCOH, the lines of authority, especially for decisionmaking responsibilities, were at times unclear or confusing; in addition, they changed at different points during the planning and execution processes. The roles of some organizations were not

<table>
<thead>
<tr>
<th>Condition</th>
<th>Achievement Level</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and effective lines of authority have been established.</td>
<td>• Organizational structure is clearly defined.</td>
<td>• Lines of responsibility and/or authority are unclear.</td>
</tr>
<tr>
<td>• Navy team</td>
<td>• Written charters show PEO-PM, TYCOM, SUPSHIP NN, ship’s force, and contractor roles and relationships.</td>
<td>• Chain of command is confusing.</td>
</tr>
<tr>
<td>• NNS team</td>
<td>• Structured program planning and execution plan is in place and is followed.</td>
<td></td>
</tr>
<tr>
<td>• The organization is effective in executing the program.</td>
<td>• Organization is in place.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Some ambiguity exists in chain of command and responsibilities.</td>
<td></td>
</tr>
</tbody>
</table>
clearly delineated, leading to confusion, and coordination during decisionmaking was often lacking. For example, during contract negotiations, last-minute work-package modifications were made in order to “fit” the cost of the work package to the available budget. These modifications typically did not consider impacts such as the need to repair systems that, because of the budget limitation, would not be replaced as originally planned.

On the basis of experience with the CVN 68 RCOH, we concluded that certain aspects of RCOH roles and responsibilities and lines of authority need improvement. Fortunately, a number of improvements have been made during the planning of the CVN 69 RCOH.

Background

An RCOH is an extremely difficult and complex project, perhaps the largest such single-system maintenance project anywhere in the U.S. military or perhaps even in U.S. industry. Further, it is executed on the world’s most complex weapon system by several organizations that have overlapping roles. Because of this complexity, it is extremely important that the proper organizations be clearly assigned the necessary roles and responsibilities to make the planning, contracting, and execution phases successful. Organizations knowledgeable about the material condition of the ship, the maintenance history of the ship, and the structural and equipment repairs to be expected must work together to develop a work package that will meet the end objectives of the RCOH. These organizations must have historical data and analytical tools available to assist in estimating workloads and costs, and they must have alternative plans if available budgets are not large enough to accomplish all the planned work. Many of these same organizations must be key members of the contracting process to ensure that the work package is properly adjusted when changes are made due to budget constraints.

If the planning and contracting phases are conducted properly by the right organizations, the execution phase will face fewer problems. A 25-year-old aircraft carrier is so complex that all the existing conditions cannot be known until systems are opened and work on the ship begins. But if the right organizations have the required responsibilities and management and decisionmaking data and tools, they can respond quickly and effectively to problems as they arise. The
organizations can decide wisely what is to be added, what is to be deleted, what is to be fixed, and what is to be deferred.

During the RCOH project, the Navy attempted to conduct both the planning and execution phases with essentially the same organizations, as shown in the RCOH PMP. Lead authority was assigned to PEO Aircraft Carriers and delegated authority was passed through PMS 312 to PMS 312D. PMS 312 was responsible for matching the work package to the available budget, for identifying reductions needed to meet budget limits, and for managing the change process during the execution phase. The PMP defined in considerable detail the specific tasks assigned to PMS 312D and the other involved organizations but failed in two key areas:

- It did not define the action authority of most of the organizations subordinate to PMS 312D.
- It did not define the coordination required among affected organizations when one of them took action to resolve problems.

Planning

The roles and responsibilities of the organizations involved in planning the nuclear work package were fairly well defined from the start, resulting in a cohesive and extensive planning effort. For the non-nuclear work, problems with the organizational roles and responsibilities started during the planning phase. Initially, because of the dissolution of PERA-CV, PMS 312 assumed responsibility for the development of the nonnuclear work package.

It is not clear, given PMS 312’s lack of practical knowledge concerning ship maintenance, especially for an undertaking as complex as an RCOH, that this was a good choice. Certainly, PMS 312 needed cognizance of the work package development process, but the actual

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2 *CVN 68 Class RCOH, Program Management Plan*, Revision 3, Change 2, June 1999. The PMP "provides the overarching plan for accomplishment of CVN 68-Class RCOHs . . . [except for] reactor plant alterations, logistics systems, repairs and material unless specifically noted" (p. 1-3). This document indicated that PMS 312D was to approve nearly all, if not all, changes to work not in the original AWP as defined at the final work-definition conference.

3 *Program Management Plan*, p. 3-5.
decisions on what repairs should be included and what could be deferred needed to be made in coordination with organizations more familiar with the ship’s maintenance history and its operational requirements.

The actual development of the repair portion of the work package began with condition inspections performed by the shipyard and ship’s crew before and during the ship’s last deployment. However, most NNS inspections associated with the nonnuclear repair appear to have been primarily for configuration management rather than for workload estimation.

In reality, NNS staff did not play a role in the development of the specific tasks in the nonnuclear portion of the work package. Discussions with them suggested that they believe this low level of participation is appropriate, given their understanding of the assigned roles and responsibilities. They see their primary role, and the focus of their planning effort, as the development of the nuclear work package plus providing work-process definitions and initial labor and material cost estimates for the tasks specified by the Navy in the nonnuclear work package. Thus, NNS, a key organization familiar with the ship and with RCOHs, did not fully participate in the (nonnuclear) planning process in the same way that Naval shipyards do for shorter availabilities. Likewise, Norfolk Naval Shipyard, which has cognizance of all nonnuclear maintenance for the Nimitz-class ships, appears to have played an insufficient role in the planning of the repair portion of the work package. There was no consensus among the key organizations we interviewed regarding what roles NNS and the Norfolk Naval Shipyard Nimitz-class hull planning yard should play or how they should be used in nonnuclear work planning. This is evidence of the lack of clearly communicated/specifed roles and involvement of key organizations during planning.

As the initial planning proceeded, SUPSHIP NN Code 1800 became involved in the work-package planning. Specifically, personnel from the dissolved PERA-CV, the organization that had maintained historical data and expertise on aircraft-carrier maintenance actions, were transferred to Code 1800, providing the expertise needed for planning the RCOH (in the CVN 69 and 70 RCOH planning, Code 1800 was involved from the beginning of the process).
TYCOM personnel also informed us that they were initially involved in the planning, but that their role greatly diminished as planning progressed.

Therefore, during the CVN 68 planning process, PMS 312 assumed a greater role and more responsibility than it should have; NNS and the Norfolk Naval Shipyard appear to have been given too little or unclear authority or responsibility; Code 1800 (i.e., the ex-PERA-CV analysts) became involved too late in the process; and the TYCOM was probably moved out of the planning process too soon.

Regardless of the problems, the planning process resulted in a work package that was included with the RFP in September 1997. The nuclear portion of the work package was thorough and explicit, with fairly accurate cost estimates. The nonnuclear portion, although far from perfect, also appears to have adequately specified the majority of the tasks to be performed. Unfortunately, there was a good deal of uncertainty about the costs of the nonnuclear work package and few, if any, well-defined options that could be used if the costs exceeded available budgets.

Negotiating the Contract

NNS submitted its proposal in December 1997, and contract negotiations began shortly thereafter. As mentioned in Chapter Three, this cost proposal was significantly higher than the Navy’s initial cost estimate, and it exceeded the budget available for RCOH execution.

The primary organizations involved in the contract negotiations were PMS 312, the contracts directorate of the Naval Sea Systems Command (SEA O2), the nuclear-propulsion directorate (SEA O8), and NNS. If there had been little contention in the work-package scope, job prioritization, and the associated costs, and if the budget had been sufficient to cover the estimated costs, the negotiation process would have been more effective. Because this was not the case, however, the Navy negotiators should have had readily available knowledge and advice from other organizations on how to adjust the work package. The organizations to provide this knowledge and information should have included at least the TYCOM, Norfolk Naval Shipyard, and SUPSHIP NN Code 1800. Unfortunately, these three organizations were not consulted or asked to provide tradeoffs or options
or to assess the implications of altering the work package during contract negotiations.

After a few months of intense negotiations, the contract for the execution of the CVN 68 RCOH was signed in April 1998. The resulting execution work package had a number of problems (discussed in more detail under Criterion 5, work-package development, below), suggesting that the successful execution of the RCOH with the money available would be difficult. One problem, reflecting the lack of participation of the TYCOM, Norfolk Naval Shipyard, and SUPSHIP NN Code 1800, was the failure to adjust other portions of the work package or to include other necessary actions when specific tasks were deleted or changed. For example, planned major upgrades of the collection, holding, and transfer (CHT) system were deleted during contract negotiations in order to stay within the available budget, but the change was not coordinated to ensure that the remaining work on the CHT system would result in a functioning system.

**Execution**

SUPSHIP NN Code 152 plays a leading role during the execution phase of an RCOH. It must monitor the cost and schedule progress of the “known” work in the work package, and it must take the lead in deciding on and approving (or disapproving) actions that arise from the IRs submitted by NNS documenting the previously “unknown” work. These IRs lead to FMRs that allow money to be allocated from the E&S pool. However, in the CVN 68 RCOH, the authority, roles, and responsibilities for the approval of changes to the work package were unclear; moreover, they were changed at times during the execution phase, and the TYCOM was not sufficiently involved.

PMS 312 initially delegated change approval authority to SUPSHIP NN and then withdrew it. At different times, at least four offices assumed and used the authority to make changes to the work package—SUPSHIP NN Code 152, SUPSHIP NN Code 400 (after consultation with Code 152), PMS 312D, and NAVSEA O2 (during contract negotiations). Considering the very fluid nature of an RCOH execution, it is necessary to make changes to the original work package in real time to meet emerging budget limits, add new essential work,
accommodate other problems, or meet key events during the overhaul. Each of these offices should probably have some measure of authority to act, but without clearly delineated authority with suitable limits and clearly delineated Navy responsibility for coordination, confusion results, along with delay and added work to adjust the other elements of the work package.

Adding to the difficulty of coordination during the execution phase, PMS 312D, where all authority resides, is located in Washington, DC, whereas the daily problems that must be resolved originate and are resolved at the shipyard. Centralized program-office management may be adequate for new-acquisition programs because most new acquisitions are both predictable and involve hundreds or thousands of scattered suppliers. Also, NNS plays a much greater decisionmaking role during new construction, as the end product—the new ship—and its requirements are much more clearly defined. It is not clear that centralized program-office management of a very fluid and uncertain RCOH “acquisition” is the best approach. (See Appendix C for commercial analogs to RCOHs and how they differ from new commercial construction.)

For the execution phase, the work package is split into the contractor and ship’s force work packages. The TYCOM’s function relates primarily to the ship’s force work package. It appears to have limited authority, responsibility, or obligation to pass judgment on the many changes made to the contractor work package with regard to their suitability for the intended use of the ship when it is restored to operation. For the CVN 68 RCOH, this may have been a consequence of the SCN funding scheme that placed funding authority with PEO Aircraft Carriers.

**CRITERION 2: COMMUNICATION**

Criterion 2 addresses communications both within the Navy and NNS and between the Navy and NNS (Table 5.2). The criterion covers communication processes and protocols, as well as the timely flow of accurate and relevant data and information. Timely and ef-

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4A third set of work tasks are performed by customer-contracted teams, which are issued subcontracts by the Navy for work during the RCOH.
Table 5.2
Achievement Levels for the Communication Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication is encouraged.</td>
<td>• Communication is completely open and timely.</td>
<td>• Communication is limited or nonexistent.</td>
</tr>
<tr>
<td>• Navy team</td>
<td>• Unique and innovative procedures are being followed.</td>
<td>• Relations are strained.</td>
</tr>
<tr>
<td>• NNS team</td>
<td>• Relevant information is freely given.</td>
<td>• Communication is only in writing.</td>
</tr>
<tr>
<td>• Navy/NNS</td>
<td>• Communication, both verbal and written, is continuous.</td>
<td>• Key information is withheld.</td>
</tr>
</tbody>
</table>

Effective communications and data flows are essential for success of a project as complex as an RCOH.

We judge that communication within Navy CVN 68 RCOH organizations needs improvement. We were unable to gather enough information to judge whether communications within NNS were adequate, but communications between the Navy and NNS appeared to need senior management attention. There were numerous instances of inadequate communications, especially in terms of data exchange, during the CVN 68 RCOH. Some difficulties arose from confusion in the chain of command, and some arose from other factors.

Most of our interviewees reported that the communication processes at the management level were good, at least within the Navy. For example, phone messages were usually returned, and required reports were usually submitted on time. However, the content and sufficiency of communications to those charged with RCOH oversight were often not adequate to effectively manage the RCOH, from the Navy’s perspective. This was primarily caused by the lack of timely data flowing between NNS and the Navy.\(^5\) For example, many of the

\(^5\)NNS provides the data specified by the government’s CDRL, but these data are not necessarily what is needed to communicate an accurate picture of an RCOH. It is
on-site representatives viewed the briefings prepared for higher authorities as typically missing important information needed to accurately gauge the status of the execution phase and to identify urgent and important problems.

Several other problems were mentioned concerning communications within the Navy, including the following:

- Because the TYCOM had been almost entirely removed from the funding and decision loop, there was poor communication of TYCOM needs regarding the final product. The TYCOM had very little involvement in deciding what work to add or subtract or how the changes would affect the final operation of the ship, despite the fact that it is the ultimate recipient. Although the need to stay within budget constraints is the responsibility of PMS 312, which therefore has final authority for changes, the TYCOM should provide prioritization of potential changes to PMS 312 to help in decisionmaking.

- Ineffective progress reporting made it difficult for the Navy to track progress in any timely way during the execution phase or to adjust the workload as needed to meet schedule and budget needs. Several different progress reports were required and were submitted. But they were not useful (nor were they used) for tracking near-term progress, because they were so far behind the current date. Also, many (such as the earned-value reports) were in the wrong format to relate to the remaining work package.

- SUPSHIP NN Code 1800 did not have easy, electronic access to the NNS IRs, so the lessons learned cannot be readily applied to its planning work on subsequent Nimitz-class RCOHs.

- Differing reporting systems often confused instead of informed. The ship’s force and NAVSEA used different work identification systems—the ship’s force used job control numbers (JCNs), while NAVSEA and NNS used SWLINs in the work package. Thus, the ship’s force could not track the shipyard’s progress in terms that correlated to their work control scheme. Difficulty checking needed tasks against NNS progress resulted in a risk necessary to update and correct the data requirements placed on NNS to match the Navy’s needs.
that the ship’s force work would not get done and no one (SUPSHIP NN, NNS, or senior ship’s force managers) would know about it.

There was a critical problem in the communications and data flows between the Navy and NNS. Many individuals in the Navy expressed frustration and mistrust with NNS regarding communications and information flow. These individuals felt that the Navy did not have timely, accurate, and relevant financial, production, and schedule data with which to assess shipyard performance and determine the need to develop alternative work-package, funding, or execution strategies.

NNS managers expressed similar frustration and lack of trust. They were concerned that providing too much data of certain types would make them vulnerable in future contract negotiations with the Navy and would provide too much detailed data that could be misconstrued without the understanding of its context and history. NNS was also concerned that providing open-book access to overhaul data would subject it to attempts by the Navy to completely change internal shipyard processes without engaging in bilateral negotiation.

The concerns of both the Navy and NNS are real and must be faced in the future by senior management on both sides if there is to be an opportunity for improvement. Timely exchange of vital information cannot be allowed to degenerate to largely ad hoc methods.

In the final year of the CVN 68 RCOH, both NNS and Navy representatives recognized that existing CDRLs were inadequate to provide the cost and schedule clarity needed to deliver the ship. Therefore, SUPSHIP NN developed an enhanced communications tool for outstanding contract changes, and NNS informally shared additional data with the Navy (as often as weekly) to fill the gaps.

CRITERION 3: COST, SCHEDULE, AND CHANGE CONTROL

Criterion 3 addresses the processes, methods, and analytical tools used to monitor and control the costs, schedule, and changes of the RCOH program (Table 5.3). These methods are needed to understand the current status of the RCOH, predict future values, and
identify both potential problems that may arise and solutions to those problems. Success for this criterion is dependent on common understanding and agreement between the Navy and NNS, the availability and use of appropriate monitoring and decisionmaking tools, and the existence of timely and accurate data. The data problems mentioned under the communication criterion also have a substantial impact on this criterion.

Based on our interviews, we believe that cost, schedule, and change control need improvement. This assessment is based on an evaluation of the Navy’s cost, schedule, and change-control methods; we were unable to gather enough information to judge whether NNS performance in this area is adequate. While the Navy had some cost, schedule, and change-control processes in place, they appear to have been ineffective in understanding and monitoring the progress of an RCOH. The lack of effectiveness stemmed from internal deficiencies in the processes, as explained below, and inadequate communications of necessary information as discussed under Criterion 2. The Navy had to rely on NNS for cost and schedule status and projections. More important, NNS and the Navy appear to have used different systems to manage cost and schedule. The Navy change-control process was indirectly tied to that of NNS but was geared more to correction of discrepancies than to control of change.

Table 5.3
Achievement Levels for the Cost, Schedule, and Change-Control Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost, schedule, and change-control methods are used.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
  • Navy team |
  • Navy/NNS |
  • Active program is in place. |
  • Used by PM and contractor as a management tool. |
  • Used by higher levels of the organization. |
  • Contractor and Navy team agree on status and prognosis. |
  • Program is limited to meeting contractual requirements. |
  • Limited use of tools by management, at all levels. |
  • Agreement on some key areas. |
  • Program is limited to meeting contractual requirements. |
  • No use of tools by management. |
  • No agreement on key areas. |
Many problems degraded the Navy’s ability to control costs and schedules. For example:

- Contract performance data were usually so far behind the current date that they were not useful for tracking actual progress and identifying emerging problems. The key report for this purpose was the monthly CPR that was to be submitted by NNS no later than “thirty-five days following the reporting cut-off date.” Often, data in CPRs were as much as 90 days behind the cutoff. CPRs were filed and forgotten at headquarters, and only a few key data points were extracted for guidance by SUPSHIP NN Code 152. Navy representatives said that these late reports were of little or no value because the RCOH was so fluid.

- NNS changed its material control system, making it impossible to track material costs on the CVN 68 RCOH for several months.

- NNS appears to have controlled the schedule by man-loading heavy-needs tasks instead of by monitoring job progress. While it was effective at addressing urgent problems, this approach did not assure good progress across the spectrum of work.

- Cost and schedule control was compromised because of the lack of a sound independent Navy cost-estimating and negotiating approach, lack of timely reports on expenditures during execution, and lack of effective coordination between the ship’s force and contractor work packages.

- The manning of the SUPSHIP NN contracts personnel who analyzed and negotiated RCOH contract changes was largely static. As a result, this staff could be overwhelmed by periods of intense change activity. At several times during the CVN 68 RCOH, there were backlogs of changes estimated at over $30 million that had not been negotiated. These unknown settlement costs tied up millions of dollars needed by the Navy and NNS to manage emergent issues. Six months after the USS *Nimitz* left the shipyard, more than $20 million in contract changes remained unadjudicated.

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6*Program Management Plan*, p. 3-15.
Because of the often inflexible change process, manning deficiencies at SUPSHIP NN, and material procurement risks, SUPSHIP NN and PMS 312 often had to authorize NNS to begin work on new jobs without a known final price. Once work had started, there was less pressure on limited NNS and SUPSHIP NN contract personnel to negotiate a price for the work, and other, more-pressing concerns were given higher priority. NNS and the Navy regularly settled such unnegotiated changes, either individually or as a group, for the actual NNS cost to complete the work. This settlement process was equivalent to allowing NNS to perform changes to the contract on an LOE basis. There is anecdotal evidence to suggest that this may be the most efficient way to accomplish the work, but the Navy and NNS have never explicitly analyzed or agreed upon this strategy.

Change control was nominally exercised by SUPSHIP NN and PMS 312, although other groups took actions that eventually resulted in contract changes (e.g., SPAWAR managed design changes). Many essential technical changes to planned work were identified each day during the RCOH process. More than 50 such changes were identified each day when the contractor began to dig into the work package. All told, more than 6,000 changes (i.e., FMRs) were identified and processed. In the face of so many proposed changes, the Navy needed specific criteria and priorities, as well as relevant, timely data, to make effective decisions. Unfortunately, preestablished decisionmaking criteria and priorities did not appear to exist during the CVN 68 RCOH, forcing the Navy and NNS to develop ad hoc criteria. Furthermore, centralized program-office decisionmaking in this environment led to delays and undoubtedly higher costs. PMS 312 clearly recognized this problem and at the beginning of the RCOH, SUPSHIP NN was delegated authority to approve changes up to $250,000. When cost growth began to mushroom, the authority was withdrawn to PMS 312.

Many of our interviewees commented that the NNS IR system involved too much paperwork and was of little value to the Navy. This was not surprising, since initiation of contract changes or requests for government guidance are only two of the many purposes served by IRs. The process consumed significant amounts of labor and affected NNS productivity adversely because of delays while awaiting government approval to proceed with the work. The system did not
serve as a control on NNS because nearly all items were legitimate problems that eventually had to be fixed. The primary effect of the IR system on the contract was exercised through the system’s tracking of how much time IRs spend with the SUPSHIP NN—data that could subsequently be used for NNS delay claims.

**CRITERION 4: RISK MANAGEMENT**

The risk-management criterion addresses the availability and use of a program and processes for identifying, evaluating, and developing plans for mitigating various types of risk that can arise during planning and execution (Table 5.4). Important aspects that the program and processes must consider include cost, schedule, and performance risks.

There was no evidence of a risk-management program of any kind in place for the CVN 68 RCOH except in the development of the modernization work package. Therefore, risk management is judged to need improvement for Navy work. We were unable to gather enough information to judge whether NNS performance in this area is adequate.

PMS 312 has addressed this issue for the CVN 69 RCOH and has developed a risk-management plan. We have not reviewed this plan in

Table 5.4

Achievement Levels for the Risk-Management Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
<th>Needs Improvement</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-management process is used.</td>
<td>• Active program is in place.</td>
<td>• Some or limited structure to the process.</td>
<td>• No structure to the process.</td>
</tr>
<tr>
<td></td>
<td>• Used by PM and contractor as a management tool.</td>
<td></td>
<td>• No risk-management process is in place.</td>
</tr>
<tr>
<td></td>
<td>• Used by higher levels of the organization.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A structured approach is taken.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


detail, but we note that it apparently distributes risk management to
the responsible technical parties (with reports to headquarters) as is
prescribed by the modernization management plan and for nuclear
work by NAVSEA O8.

Some other parties have begun addressing risk, independent of PMS
312D. Repairing of tanks and voids is, for example, a particularly ex-
pensive item during major overhauls. Therefore, AIRLANT has de-
veloped a life-cycle tank maintenance plan for CVN 69 so the total
amount of tank work is known and can be parceled out among the
appropriate availabilities, including the RCOH. The plan already
has value. NNS advised that for CVN 69 it could do no more than
about 220 of the approximately 800 tanks during the RCOH, whereas
AIRLANT had intended that more be done. With the plan in hand,
AIRLANT can now address the incomplete work and schedule it for
accomplishment during future availabilities.

CRITERION 5: WORK-PACKAGE DEVELOPMENT

Criterion 5 addresses the development of the work package for the
RCOH (Table 5.5). The total RCOH work package contains three
fundamentally different kinds of work: (1) refueling and repair of the
ship’s reactor plants; (2) the addition of new, more-modern capabili-
ties such as new sensors or communications systems; and (3) the re-
pair or replacement of existing systems and equipment to restore or
improve upon the original function of the ship. This total work
package is further broken into separate work packages for the orga-
nizations that will accomplish specific tasks—NNS, the ship’s force,
or other.7 The work packages also evolve: The authorized work
package that results from the planning process and is contained in
the RFP differs from the execution work package that results from the
contracting process.

A sound, complete, and well-thought-out work package, which is
translated into ship’s force and contractor work packages, is essential

7In addition to NNS and the ship’s force, private subcontractors or other Navy orga-
nizations such as the public shipyards or intermediate repair facilities may perform
work. Separate “contracts” (and, therefore, work packages) may be negotiated with
these other organizations, or NNS and the ship’s force may subcontract with private
firms to perform certain tasks in their individual work packages.
Table 5.5
Achievement Levels for the Work-Package Development Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements and work package definition are clear and sound.</td>
<td>Needs Improvement</td>
</tr>
<tr>
<td>Navy, NNS</td>
<td>Needs Senior Management Attention/Action</td>
</tr>
</tbody>
</table>

- Ship condition is well defined.
- Requirements are well defined.
- Criteria are established for altering the work package to reflect mandatory work.
- Changes in the work package are well controlled.
- Work package development and implementation are carefully tracked to closure.
- Some aspects of the ship's condition are poorly defined.
- Requirements and criteria are loosely defined and frequently changed.
- User requirements/work package are frequently changed.
- Parties participate unequally.
- Many aspects of the ship's condition are uncertain.
- Requirements and criteria are ambiguous, open for interpretation between organizations.
- Requirements/work package are changed continuously.
- One organization dominates.

for an effective availability of any kind, and particularly for a very large, complex aircraft-carrier RCOH. As discussed under previous criteria, the organizations with the greatest expertise in aircraft-carrier availabilities and with knowledge of the condition of the ship were not involved early enough or completely enough in the development of the CVN 68 RCOH work package. Also, historical data on carrier availabilities were not adequately used to estimate the workload for this RCOH. Partly for these reasons, the work package produced by the planning process overlooked or underestimated critical work. More important, the relationships between tasks and alternatives (if tasks were deleted) were not available to support the contracting process. When changes were made to “fit” the work package to the available budget, the resulting execution work package had problems that led to difficulties in execution and cost control. For these reasons, we judge that work-package development needs senior management attention.
Several issues affected the development of the work package:

1. The goal for the RCOH was unclear and was changed over the course of the planning cycle. This led to confusion about what tasks should or should not be included.

2. Some necessary work was not included in the authorized AWP or in the subsequent contractor and ship's force work packages. For example, total ship testing (nonnuclear) was not given adequate attention in the authorized AWP.

3. The ship's force work package was not adequately planned and integrated with the contractor work package and with ship training requirements.

4. The work package appeared not to consider subcontracting of major tasks as a means of reducing cost.

**Unclear Goal or End Objective**

The goal for the reactor-plant work—to complete refueling and repairs and provide energy for another 23 years of ship operation—remained constant, but the goals for other work drifted and were never clear. Some interviewees believed that the original goal was to make the USS *Nimitz* similar to a new-construction ship. When the work needed was considered, this goal turned out to be impossibly expensive, as experience with earlier ship-life-extension-program complex overhauls of nonnuclear carriers should have shown. Later, the goal was seen as "pass the Board of Inspection and Survey (INSURV) trials with ease," but this is not meaningful, as all ship's maintenance is done with the goal of passing INSURV with ease. "Recapitalize" is the current goal expressed in the PMP, but that word has different meanings to different organizations. A clear, understandable goal for the RCOH, other than to refuel the ship, would help everyone. One such goal would be to get agreement from all stakeholders on what should be included in the authorized work package, given the budget constraints, and to strive to complete that work within the budget available.

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The lack of clear goals for work-package development led to two types of errors in the CVN 68 RCOH. First, the ship’s force had become accustomed to many problems during recent operations at sea and was focused on current operations. It may not have recognized a problem as something needing correction if the ship is to operate for another 23 years. As an example, plating and structural corrosion in an arresting-gear room in CVN 69 was so severe that the ocean was visible through holes. Yet this problem was not reported by the crew and was thus not included in the CVN 69 work package. Therefore, it is not necessarily wise to rely on the ship’s force for significant input to the repair work package unless the crew has training on what to look for and how to report it. Second, poor decisions were made by personnel involved in contract negotiations who similarly lacked both familiarity with goals and specific system knowledge. For example, CHT system upgrades were planned, but when they were deleted to meet the budget, no compensatory action was specified for other work-package elements. More attention, training, experience, and perhaps codification of inspections in the work-package development process are needed.

Goals must encompass what the Navy desires in the final product at delivery. If the product is to be a war-ready ship, all equipment installation and repair must be included in the work package, and crew training sufficient to support unrestricted ship operations on delivery must be allowed for. This latter goal may have implications with regard to the ship’s force work package, as discussed below. It also has implications for the combined PSA/SRA that follows the RCOH.

A function of the PSA/SRA for CVN 68 was to install the combat system.9 This was put off until after the RCOH for two reasons: to give the ship the benefit of the newest equipment on reentering the fleet, and to allow the funding for the repair and modernization of the ship to be further spread out. Similar concepts were employed in planning for the CVN 65 RCOH in 1990–1994. Whether such practices should continue depends on the Navy’s goals for the RCOH. The CVN 68 approach may serve budget needs, but it leaves the ship unfit as a fighting platform at the conclusion of the RCOH and therefore

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9Guarantee and warranty work is accomplished during the PSA. For the CVN 69 RCOH, the combat system will be installed during the RCOH and not the SRA.
lessens the total portion of the ship’s life that she is available for her mission. The INSURV inspection at the completion of the RCOH would be troubled at best and would certainly not be passed “with ease.”

**Failure to Include All Necessary Work in the Authorized AWP and Contractor and Ship’s Force Work Packages**

Contrary to the PMP, the CVN 68 authorized AWP did not necessarily represent all of the known essential work. Many interviewees noted that the condition of CVN 68 was not well reflected in the work package and that better inspections and reports were needed to determine the material condition of the ship and develop a complete work package. Examples include the following:

- **Repair of elevator stanchions.** Many people knew this work was necessary, but it was inexplicably left out of the work package, leading to over $1 million in cost growth.

- **Catapult repair.** A condition survey of catapults was needed to determine the necessary repairs, and a detailed survey required catapult disassembly. This was not done, nor was consideration given to the history of catapult repairs on other carriers. Therefore, the plans for catapult repair were inadequate and it was left to an open-and-inspect process to determine what work was needed, leading to inevitable cost growth later in the RCOH.

- **Propulsion-plant repair.** Many propulsion tests and preoverhaul inspections require plant cooldown. This was not done, so the work package in some propulsion-plant areas was poorly defined.

- **Ventilation-system repair.** A thorough inspection and reference to experience in other aircraft carriers would have shown that the

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10 Program Management Plan, p. 3-22.

11 AIRLANT reported that assessments of CVN 69’s condition to support development of the ship’s RCOH AWP were believed to be complete and effective. Others noted that significant deficiencies in the CVN 69 AWP were found during prearrival inspections (see the corrosion example mentioned above).
work package should have included replacement of much of the ventilation ducting and fans.

- **Painting, lagging, and tiling.** These items were considered too hard to price accurately, so they were taken out of the basic work package and left to the LOE pool to fund. The costs of this work could have been estimated from prior aircraft-carrier experience.

- **Turbine-generator repair.** This was known to be essential well before the start of the RCOH but was not included in the work package. This item alone led to cost growth of over $20 million.

One notable oversight in the work package was the lack of a suitable overall test plan. Testing is the principal execution issue facing the program toward the end of an RCOH. Overall, the NAVSEA process and support for installation and testing of new equipment was reported to be immature and inadequate. NNS’s approach to testing is to extrapolate from its new-construction test program, since that is the bulk of its experience. This approach works poorly because of the many differences between new and in-service ships. Also, some portions of the test plan that were developed by NAVSEA were not well laid out and supported. For example, new microprocessor technology replaced much of the old analog system in the new steam-plant control system; in light of that change, the documentation and test plan were insufficient.

Whatever the deficiencies in the authorized AWP, some of its items failed to appear in the contractor or ship’s force work packages derived from it and had to be restored or supplemented when the shortcomings emerged during the RCOH. In negotiating the contract for the authorized AWP execution, many differences arose between the authorized AWP and the contractor’s work package that were not coordinated with the appropriate technical experts. Some of the differences were not noted until the RCOH execution phase was well along. NNS is supposed to issue “clarifications and exceptions” to the authorized AWP when presenting the contractor package, but it neglected to mention many of them. And the Navy did not always spot these omissions. An example was provided in which the authorized AWP called for the repair of seven valves of a specific type, whereas the contractor work package called for repairing only six.
The Navy appeared not to crosscheck the NNS clarifications and exceptions with the final authorized AWP.12

Development and execution of the ship’s force work package was also problematic. The original package was developed about two years before the start of the overhaul by selecting from the current ship’s maintenance plan (CSMP) those tasks (JCNs) suitable for intermediate maintenance activity or ship’s force accomplishment. The remaining tasks were placed in the work package for NNS accomplishment under a different numbering system. More ship’s force work was added after negotiation of the NNS contract to pick up items that were not in the NNS package. As the overhaul progressed, still more work was added to help contain the overall cost of the RCOH. The quantity of work grew beyond ship’s force capabilities, and the overload was subsequently resolved by a budget addition and reassignment of work to subcontractors or NNS. The budget addition appears as growth, although for most of the work, the need could have been identified well before the start of the overhaul.

Modernization parts of the work package also suffered from inadequate planning. A good example was installation of the integrated communications and advanced network (ICAN). Engineering of the system led to junction boxes being placed in spaces designated for other purposes. No consideration was given to the added ventilation requirements for cooling the equipment, which led to further unbudgeted growth.

Inadequately Planned and Integrated Ship’s Force Work Package

Some people we talked to suggested that a large ship’s force work package provides a significant benefit to the Navy, while others suggested that there is little or no benefit and the package interferes with essential training. The ship’s force work package, as it evolved for CVN 68, required the ship’s force to perform valve refurbishment; deck tiling; living-space refurbishment; repainting of spaces, tanks, and voids; and other housekeeping work. The ship’s force also

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12For CVN 69, more checks of consistency of the contractor’s package are being made by SUPSHIP Code 1823, and the office staff was increased to do this.
viewed monitoring NNS work execution as one of its primary contributions.

The USS *Nimitz* had a crew of approximately 2,700 officers and sailors throughout the RCOH. On average, only about 20 percent of a sailor’s work day (or less, depending on the ship department) is available for executing the ship’s force work package, including oversight of subcontractors. Ship’s force direct and subcontractor work originally was not coordinated well with NNS, and this led to interference and rework. In December 1999, AIRPAC assigned one carrier-availability support team (CAST) worker to help with coordination, and it assigned a second in June 2000, when the need for more help became evident.

Because the ship’s force does not get its pay and benefits from the RCOH funds, it is viewed by some as a pool of “free” labor available to do simple maintenance tasks for no more than the cost of materials, resulting in a much lower price than would be charged by NNS or a subcontractor. One person expressed the view that because maintenance is a normal part of a sailor’s job, using the crew for maintenance during RCOH is not a breach of faith. Others noted that sailors are not trained to do most of the work in the ship’s force work package (e.g., bunkroom restoration and removing excess wires from wire ways) and are therefore inefficient. Many highlighted the fact that much of the work the ship’s force did had to be redone by subcontractors or by NNS.

However, the primary concern among senior ship personnel is the impact of the ship’s force work package on crew training. The primary duty of the ship’s force is to operate the warship on assigned missions and perform the maintenance assigned by the CSMP. These tasks require a sustained training regimen, but in the RCOH, the ship is torn up and the ship’s force work package takes most of the time ordinarily assigned to training. In addition, only about 20 percent of the individuals who were in the crew when the ship left NNS had arrived with the ship. The rest were new or transferred sailors who needed additional training to qualify on the ship’s systems. This imposed a large training burden that was nearly impos-

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13 The crew was housed off-hull for most of the availability but reported aboard daily for its assigned tasks.
sible to meet within the circumstances of the RCOH. If an RCOH goal had been to have the ship ready to start the deployment workup on delivery, an even larger training burden would have resulted. Also, the difficulty of training in the overhaul environment may contribute to significant errors. An expensive steam-plant component was improperly operated during the CVN 68 RCOH test program and it failed—a failure attributed in part to inadequate training. Opinion is divided on whether the ship’s force work package should be eliminated and the ship decrewed to the point where only essential watchstanding and oversight functions are manned or whether the current practice should continue. The decrewing concept itself is problematic; it is not clear that the Navy personnel system can manage such a strategy.14

Even if we assume that the ship’s force was appropriately assigned an important share of the work on the CVN 68 RCOH, the work package was not meaningfully integrated with the contractor’s work package once it was extracted from the authorized AWP. The manager of the ship’s force work package sent general work plans to NNS to review and provided a list of potential conflicts, but complete integration was not achieved, leading to delays and added costs. We were given many examples of avoidable conflicts. As with the deficiencies due to lack of training, problems in areas such as habitability improvements and tiling led to rework. Flaws in integration were the result of having separate planning and execution groups for the contractor and ship’s force work packages. Integration was partially achieved late in the RCOH with the addition of more help in SUPSHIP NN and is being improved further in the CVN 69 RCOH.

**Failure to Consider Subcontracting of Major Tasks to Reduce Cost**

SUPSHIP NN and PMS 312 subcontracted some of the ship’s force work-package responsibilities where subcontractors could do the work better and at an affordable cost. However, NNS was assigned

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14Some CVN 68 officers suggested in interviews that the crew should be removed from the ship during the RCOH, but the commanding officer felt strongly that the crew should stay with the ship. It has been reported that the CVN 69 crew is fully engaged in the RCOH and is accomplishing a significant amount of necessary work.
all “critical path” work, i.e., work that had to be done according to the schedule to ensure that the project finished on schedule, while other work was split between the ship’s force and Navy subcontractors to meet time, manpower, and money limits. NNS also did a large amount of work that does not appear to have required particular skills, such as tank inspection and restoration. Significantly more work could be subcontracted if it were permitted by NNS labor agreements and if NNS and the Navy could establish better communications and plans regarding desired core capabilities of the shipyard. It is clear that NNS has the in-house capability to manage subcontractors; Navy personnel reported that NNS performed well at integrating subcontractors for shorter carrier availabilities on the West Coast.

CRITERION 6: COST ESTIMATES

Accurate and well-founded cost estimates are necessary to prepare and justify budget requests and to understand the fiscal impacts of adding or deleting tasks from the work package (Table 5.6). The

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost estimates are well defined and justified.</td>
<td>All parties actively participate. All identified work and resources are estimated.</td>
<td>Major uncertainty in required work and resources.</td>
</tr>
<tr>
<td>• Navy</td>
<td>• Previous experience and records are used to develop estimates.</td>
<td>• Limited historical data are available.</td>
</tr>
<tr>
<td>• NNS</td>
<td>• Knowledge, data, and experience of public yards are utilized.</td>
<td>• Public yard experience with ship and maintenance records use is limited.</td>
</tr>
<tr>
<td></td>
<td>• A disciplined process is in place for revising estimates in a comprehensive and timely manner.</td>
<td>• Revised estimates, and causes of variances are delayed but still useful.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Historical data are unavailable or not used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Limited or no use of public yard experience.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revised estimates are not timely, and variances are not documented.</td>
</tr>
</tbody>
</table>
Navy had little or no ability to estimate the cost of planned work in the CVN 68 RCOH, and there was little or no tie between the planned work and the budget for that work until the RCOH was ready to begin. For these reasons, Navy cost estimation is judged to need improvement.

Even though the PMP requires that “activities performing planning tasks submit cost estimates to PMS 312 for the tasks involved,” there is no capability within the Navy for this to be done accurately and completely for other than nuclear and modernization work. Therefore, it is left to the contractor. In the CVN 68 RCOH, detailed cost estimating for the authorized AWP nonnuclear repair package was carried out almost entirely by NNS because the Navy does not have enough experienced cost estimators or a good cost database to develop its own estimates for such a large job. NNS thus provided cost estimates for a series of evolutionary work packages from the Navy during the planning phase and for the authorized AWP, which were used to negotiate the contractor’s work package. SUPSHIP NN provided an evaluation, called a technical analysis and report (TAR), of no more than 1 percent of the NNS estimates and used the results to extrapolate a baseline Navy estimate for negotiation purposes. Thus, NNS had almost total control over the Navy’s initial cost estimates.

The Navy rationalized this approach on the grounds that the CVN 68 RCOH was a first-of-its-kind project with no history, and some NNS conditions were unknown, e.g., parts availability, time availability, money availability, and the possibility of deferral of work. SUPSHIP NN noted that to its knowledge, no one examined the Navy’s 50-year history of large-deck aircraft-carrier maintenance for what it could teach about the cost of basic repair and restoration on systems common to all carriers, such as tanks, painting, and lagging. We have reviewed readily available data of this type, and we observe that all such ships share similar systems and problems in many areas.

SUPSHIP Code 1800 and Code 400 are doing more independent cost estimating for the CVN 69 RCOH.
CRITERION 7: INCENTIVES

We examined incentives within the institutional environment and the processes used that might have affected the attitude of Navy and NNS management personnel and the actions of all personnel and organizations involved in the RCOH (Table 5.7). Overall, we detected no lack of personal incentives among those interviewed regarding the desire to successfully complete the USS Nimitz RCOH and subsequent RCOHs. All organizations, including the PEO, NNS, SUPSHIP NN, and the ship itself, wanted to deliver a quality ship on time and within budget. For these reasons, the establishment of incentives is judged as good.

Our one concern is with the contract incentives offered to NNS. Although they included share lines and other mechanisms that could have substantially increased NNS’s fee, they appeared to have little impact during the CVN 68 RCOH. Part of the problem was that contract negotiations left NNS in a position where it was difficult to achieve cost reductions. Part of the problem may have been that even the lowest fee possible, 9 percent, provides a healthy return to NNS. Regardless of the circumstances of the CVN 68 RCOH, both the Navy and NNS should continue to strive to find contract incentives that would result in a win-win situation for both parties.

Table 5.7
Achievement Levels for the Incentives Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives are apparent and appropriate. • Navy • NNS</td>
<td>• Visible incentives can be recognized. • Limited or no disincentives affect program execution. • Incentives are weak or limited. • Some disincentives are present, and they influence program execution. • No visible incentives. • Disincentives are obvious and are detrimental to the program.</td>
</tr>
</tbody>
</table>
CRITERION 8: FUNDING

Funding adequacy and stability in Navy work is judged to need improvement (Table 5.8). The funding source for RCOHs was changed from O&MN to SCN (and management was refocused on headquarters) for the last USS Enterprise RCOH in response to difficulties arising from the way O&MN funds were budgeted. We have not reviewed the details of this decision; we observe only that the SCN approach appears to incorporate some unintended consequences.16

The nearly universal opinion among all those we asked was that the budget for the CVN 68 RCOH was inadequate and known to be so at the outset. We did not have access to details on precisely how the budgets for CVN 68 were developed, but as we understand it, early in the Program Objective Memorandum (POM) process, the total budgets were developed from the cost of earlier aircraft-carrier overhauls, adjusted to reflect known nuclear work plus desired modernization improvements. Budgets developed in this way were, in the aggregate, not far from the budgets actually required. For example, the February 1995 President’s budget showed $2.6 billion for the RCOH. Of that, $300 million was deleted when the cost of the nuclear work package was found to be lower than had been estimated.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding is adequate and stable, and control and support (from OSD, Congress, the Service) are ensured.</td>
<td>Good: Funding is stable (and adequate). PM/PEO inputs are accepted.</td>
<td>Needs Improvement: Funding is adequate. Defense of resources requires continuous PM/PEO actions.</td>
</tr>
</tbody>
</table>

Table 5.8

Achievement Levels for the Funding Criterion

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16Among these consequences has been the reduction of the TYCOM’s customary role in overhaul decisionmaking. This might be corrected administratively within the SCN structure.
earlier. The adjusted FY95 President’s budget was thus $2.3 billion—within 3 percent of the actual amount spent to the end of the RCOH. This is certainly good budgeting, at least at the macro level.

Later budget pressures complicated the picture. Budgeted amounts were driven as low as $2.0 billion at the beginning of the execution phase of the RCOH. When compared to the actual amount spent at the end, the overall growth from that level was about 15 percent. Evaluation of the details suggests that the budgeting and planning decisions made to accommodate a lower top line were not necessarily well informed. We have, for example, been advised that the budgeted allowance for the inspection and repair of tanks and voids was placed in an E&S pool. Later in the overhaul, when essential tank and void work emerged, the pool had been depleted.

Lack of timely and sufficient funding inevitably leads to poor decisions and adversely impacts progress and efficiency. A better-informed budget-development process is needed to prepare and defend future CVN RCOH budgets.

**CRITERION 9: MANAGEMENT**

The stability and size of the Navy management team are judged to need improvement (Table 5.9). This applies not only to top-level management but also to the staff with responsibility for planning and managing contractor work. Staff development is also a problem in some quarters. We were unable to gather enough information to judge whether NNS performance in this area is adequate, although we note that NNS made management changes during the CVN 68 RCOH execution.

Since the beginning of the CVN 68 planning period in 1993, there have been two headquarters program managers, four deputy program managers, and four assistant program managers working on the RCOH. On average, the individuals in these jobs have changed every 2.5 years. The program manager is a Naval officer who is unlikely to serve more than two to four years before moving on to a new job or to retirement. These typical short tours of duty relative to the seven-or-more-year duration of an RCOH further reduce the experience level and prevent experience from building and being applied as the execution unfolds. We recognize that the practice of frequent
Refueling and Complex Overhaul of the USS *Nimitz* (CVN 68)

Table 5.9
Achievement Levels for the Management Criterion

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Good</th>
<th>Needs Improvement</th>
<th>Needs Senior Management Attention/Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management team is selected for credibility and stability and is adequate in size.</td>
<td>• Program manager is well accepted up/down the chain of command.</td>
<td>• Program manager has limited program-management background or limited shipyard experience.</td>
<td>• Program manager changes frequently.</td>
</tr>
<tr>
<td>• Navy</td>
<td>• Program manager selection follows an approved process.</td>
<td>• There is no set plan for rotation based on milestone decisions.</td>
<td>• No basis established for program manager selection.</td>
</tr>
<tr>
<td>• NNS</td>
<td>• A set plan for program manager and key personnel rotation is in place.</td>
<td>• Program manager is questioned frequently on his/her actions.</td>
<td>• Program manager’s views are not accepted.</td>
</tr>
<tr>
<td>• Defense Acquisition Workforce Improvement Act (DAWIA) is followed.</td>
<td>• Adequate personnel are assigned.</td>
<td>• Infrequent management team changes take place.</td>
<td>• Frequent management team changes.</td>
</tr>
<tr>
<td>• A set plan for program manager and key personnel rotation is in place.</td>
<td>• Defense Acquisition Workforce Improvement Act (DAWIA) is followed.</td>
<td>•Mismatch between numbers of personnel/skills assigned and the workload.</td>
<td>• Insufficient personnel are assigned.</td>
</tr>
</tbody>
</table>

Within the SUPSHIP NN office, there is some continuity in the civilian workers in the Planning Department, but they were not used for the planning of the CVN 68 RCOH until late 1996, after much of the original planning was done. We understand that the SUPSHIP NN planning group was much more involved in CVN 69 RCOH planning.

SUPSHIP NN Code 152 has heavy responsibility during the execution phase, but we believe that it was not staffed adequately for the PMS 312 field-representative function or even to administer the CVN 68 RCOH work package in the normal manner akin to the approach used on repair of other Navy vessels. For example, Code 152’s staff was the same size for the 3 million man-day CVN 68 RCOH as it would be for a normal “large” availability, which is less than one-tenth the size. The existing staff could handle only problems of the rotation of Naval officers would be difficult to change, but as time goes on, the pool of officers with RCOH experience will continue to grow.
day and had little or no time or tools to follow progress or anticipate problems.

SUPSHIP NN Code 152 is recommending reorganization of SUPSHIP NN into project codes specific to each carrier as each enters the RCOH planning stage. Each ship code would include cost/budget, planning, and execution personnel drawn from existing SUPSHIP NN codes or hired in for specific expertise that would be fully focused on the successful planning and completion of the RCOH. An individual who would be expected to continue in the job through the entire process would head each code, and rotations into and out of the code would be managed to ensure that experience level is commensurate with the tasks. This approach is targeted on many of the deficiencies identified in this report, but it would require sustained support from PMS 312 to be effective.

In sum, there are many areas where staff development would lead to more-effective and better-managed RCOHs.

**SUMMARY**

Table 5.10 provides a summary of the assessments for the various criteria.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Achievement Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear lines of authority are established.</td>
<td>X</td>
</tr>
<tr>
<td>Communication is encouraged.</td>
<td>X</td>
</tr>
<tr>
<td>Effective cost, schedule, and change control methods are used.</td>
<td>X</td>
</tr>
<tr>
<td>Risk-management program/process is used.</td>
<td>X</td>
</tr>
<tr>
<td>Requirements/work package is well defined.</td>
<td>X</td>
</tr>
<tr>
<td>Execution cost estimate is well established and agreed upon.</td>
<td>X</td>
</tr>
<tr>
<td>Incentives are apparent and appropriate.</td>
<td>X</td>
</tr>
<tr>
<td>Funding is stable and adequate.</td>
<td>X</td>
</tr>
<tr>
<td>Management team is selected for credibility and stability.</td>
<td>X</td>
</tr>
</tbody>
</table>