In this chapter, we establish a context that should be helpful in understanding what follows. We begin by describing the institutional framework within which the parties involved in the CVN 68 RCOH functioned. We then review some of the challenges these parties faced as planning got under way.

INSTITUTIONAL FRAMEWORK

Navy responsibility for managing an RCOH is divided among five organizations: the Program Executive Officer (PEO) Aircraft Carriers; the Naval Nuclear Propulsion Program (NNPP); the Supervisor of Shipbuilding, Conversion, and Repair, Newport News (SUPSHIP NN) under the Naval Sea Systems Command (NAVSEA); NNS; and the ship’s force. A sixth organization with an important stake is the type commander (TYCOM), which owns the ship.1

Program Executive Officer

The PEO carries out all headquarters-level responsibilities for the acquisition and life-cycle management of aircraft carriers. For a Ship Construction, Navy (SCN)-funded program such as an RCOH, the

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1Another organization concerned with aircraft carriers is N78 (Air Warfare Division), the resource sponsor on the Chief of Naval Operations (CNO) staff. This office nominally determines carrier warfighting requirements and capabilities and has responsibility for obtaining the funding necessary to support new construction, refueling overhauls, and naval shipyard maintenance activities. Thus, it both sets requirements and provides resources.
PEO reports to the Assistant Secretary of the Navy for Research, Development, and Acquisition. The PEO also reports to the Chief of Naval Operations (CNO) through the NAVSEA Commander for matters pertaining to in-service support.

Under the PEO, the Aircraft Carrier Program Office (PMS 312) executes all PEO responsibilities pertaining to aircraft carriers, including design, construction, and maintenance. Management authority, including budgeting, for RCOHs is delegated to the assistant program manager for RCOHs (PMS 312D). PMS 312D either performs internally or manages all aspects of the RCOH from initial budgeting and work planning to execution and follow-up lessons learned, except those responsibilities under the cognizance of the Naval Nuclear Propulsion Program (NNPP).²

During the planning for the CVN 68 RCOH, the PEO structure was in the midst of a major change. Aircraft-carrier programs were originally part of PEO Carriers, Littorals, and Auxiliaries (PEO CLA). The major focus in that office during the early stages of the CVN 68 RCOH planning was the Landing Platform Dock (LPD) 17 program and challenges to the construction of CVN 77 in light of the future aircraft-carrier-class (CVX) program.³ The reorganization of all carrier responsibilities under a separate, new PEO resulted in some disruption during the start of the CVN 68 RCOH planning process.

**Naval Nuclear Propulsion Program**

The NNPP exercises its responsibilities through three elements: The Director of the NNPP, within the Office of the CNO, and the Deputy Commander of NAVSEA for Nuclear Propulsion (O8) are responsible for the technical aspects of the propulsion plant. NAVSEA O8 also has overall program management responsibility, including identification of budget needs for the nuclear work in the RCOH. The Deputy Administrator for Naval Reactors, within the Department of Energy, is responsible for reactor safety.

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²PMS 312D is, however, responsible for fiscal management of the entire program.

The NNPP has its own staff of engineering and management personnel who provide overall management of its portion of the program. Other key NNPP facilities that serve RCOHs include:

- Two government-owned, contractor-operated (GOCO) Department of Energy laboratories (Knolls and Bettis Atomic Power) dedicated to the NNPP, which contain much of the program’s engineering capability.

- A GOCO procurement organization devoted to acquiring certain NNPP materials needed to conduct the RCOH and a specialized office within the Naval Supply Systems Command for acquiring and supplying consumable materials needed for maintenance of NNPP hardware.

- A planning capability designated the Carrier Reactor-Plant Planning Yard (RPPY), which performs much of the RCOH planning for nuclear work, including development of the nuclear work package, known as the carrier reactor-plant overhaul package (CARPOP). (This activity also supports planning of Incremental Maintenance Plan (IMP) availabilities of nuclear-powered aircraft carriers.) The Carrier RPPY is operated by NNS and has accrued many decades of nuclear planning experience for aircraft carriers.

To implement its safety responsibilities, the NNPP maintains Department of Energy field offices, designated the Naval Reactors Representative’s Office (NRRO) at nuclear-capable shipyards. At NNS, this office monitors work aboard the RCOH ship and elsewhere in the yard to ensure that it is conducted in a manner that assures the continued safe maintenance, repair, and subsequent operation of the ship’s reactor plants.

The NNPP has access to all NAVSEA offices where work is done on matters that interface between nuclear and nonnuclear responsibilities. It also has access to NNS on technical issues, indirectly by way of PMS 312D and directly from its own technical staff. For safety matters, it has access to the yard by way of the NRRO.
Naval Sea Systems Command

NAVSEA is responsible for contract administration and day-to-day management of the RCOH’s execution phase. The latter function is provided by a field office, SUPSHIP NN. This office holds the primary responsibility for ensuring that the shipyard complies with the contract and that problems are identified and resolved quickly. The primary agent for this work is SUPSHIP NN Code 152 (which is also subordinate to PMS 312D). Other SUPSHIP NN offices provide services to the supervisor himself or to PMS 312D when tasked. These services include work planning, financial-report review, non-nuclear engineering, design review, quality assurance, government-furnished material procurement and management, and financial management.

The Code 1800 group in SUPSHIP NN supervises the planning of the RCOHs. A number of the Code 1800 members were formerly in Planning and Engineering for Repairs and Alterations–Carriers (PERA-CV). PERA-CV was a field activity of PEO Aircraft Carriers that provided life-cycle support, contracting services, logistics assistance, and management to support carrier overhaul planning and execution. Among its support functions, it tracked the availabilities of all aircraft carriers and maintained a database of tasks and man-days for those availabilities. PERA-CV was dissolved through base realignment and closure (BRAC) actions, and the personnel either retired or were dispersed to other organizations, such as Code 1800 at SUPSHIP NN. As we discuss later, the uncertainty surrounding PERA-CV and its personnel caused problems during the early planning stages of the CVN 68 RCOH.

Newport News Shipbuilding

NNS is the largest shipbuilder in the United States in terms of both facilities and employment and is the only U.S. shipyard with the capability to build and refuel nuclear aircraft carriers. In addition to the CVN 68 RCOH, NNS has performed an RCOH on the USS Enterprise and has done a number of other carrier availabilities, including complex overhauls (COHs) of both CVN 68 and CVN 69.

NNS is the planning yard for the nuclear portion of the RCOH. For the nonnuclear portion of the CVN 68 RCOH, NNS primarily pro-
vided cost estimates based on their detailed planning of the execution of the tasks identified by the Navy organizations. It negotiated with the Navy for the cost and scope of the contracted work and executed the entire nuclear work package and most of the nonnuclear package.

**Ship’s Force**

There were approximately 2,500 enlisted sailors and 150 officers in the ship’s crew during the CVN 68 RCOH. Since the ship cannot support the full crew during an RCOH, the Navy must provide temporary housing and other support functions. NNS, under contract to the Navy, provides a portion of these support functions. Since CVN 68 is a West Coast ship, the Navy provided transportation for the families of the crew (funded in the Military Personnel, Navy (MPN) budget) and housing for the single members of the crew who live onboard the ship when it is not being overhauled.

The crew performs various functions during the RCOH, including

- General watchstanding and oversight of the various compartments and spaces on the ship.
- Safety aspects of work, including closing of valves and circuit breakers (referred to as “tagouts”).
- Ship security.
- Operation of shipboard equipment.
- Immediate response to fire or flooding.
- Training to support crew certification at delivery.
- Maintaining ship cleanliness.
- Logistics support, including records updating.
- Ship administration.

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4The CVN 68 Class Ship Manpower Document (14 June 1999) lists a requirement for 170 officers and 3,323 enlisted personnel. Typically, 85 to 90 percent of the requirement is authorized, and a ship may have even a lower percentage actually assigned to it.
The crew also is responsible for the administration and execution of the ship’s force work package, a set of tasks in the overall work package designated as the responsibility of the crew. These tasks include repair of ship systems and the refurbishment of hundreds of onboard living spaces.

**Type Commander**

Commander, Naval Air Forces Pacific (COMNAVAIRPAC) is the TYCOM for the USS Nimitz. As such, COMNAVAIRPAC has administrative control over the ship, responsibility for the vast majority of life-cycle maintenance done on the ship outside of the RCOH, and responsibility for seeing that the ship deploys fully trained and prepared for her operational commitments. COMNAVAIRPAC participated in decisions on the repair and modernization portions of the CVN 68 RCOH.

**CHALLENGES**

As RCOH planning got under way, PEO Aircraft Carriers and the other organizations involved faced a number of challenges and uncertainties that threatened timely and on-budget completion. The story of the RCOH is one of both success and shortfall, and the extent to which it is one or the other reflects the Navy’s (and the contractor’s) success or failure at meeting these challenges.

**Budgetary Uncertainties**

The USS Nimitz was the first ship of its class to have an RCOH, and only the second of any carrier class, following the USS Enterprise (CVN 65). CVN 65 is a one-ship class of a different design, particularly with regard to the nuclear propulsion plant. Hence, her maintenance experience was not entirely applicable to the Nimitz class. What, then, would the Navy use as a basis for estimating cost and schedule? What types and magnitudes of work might be included in these estimates?

There was reason for optimism that these questions could be addressed within some confidence range across a large proportion of the ship’s needs. The USS Nimitz was the ninth large-deck aircraft
carrier the Navy had built and operated since it built the USS *Forrestal* in 1955. All large-deck carriers have many similar characteristics, including nearly equal size and power, similar tanks and voids, similar electric power distribution and ventilation systems, similar crew sizes and habitability systems, and approximately equal painting and preservation needs. These similarities should have guided development of planning in these common areas. Substantial uncertainty may have remained, however, regarding cost estimates on first-of-a-kind elements such as the never-before-refueled Nimitz-class reactor plants and combat system modernization.

While these uncertain estimates were being faced in bottom-up estimation of task requirements and costs, another set of uncertainties was acting from the top down. Large projects are typically constrained by a budget ceiling that only notionally reflects the work that must be done and is subject to various external factors. The work scope would thus have to be set to a budget rather than the reverse (as is typical in commercial projects). The difficulty of such a method is that it is very hard to align the expectations of all the stakeholders. When the budget is constrained, some work must be forgone. How planners prioritize the work to be done and communicate those priorities is critical to the program’s success. Moreover, planners knew at the outset that the budget constraint was potentially a moving target. What might look feasible one year might not be feasible the next.

**Sources of Uncertainty with the Ship and in the Yard**

Even given previous experiences with similar ships, it is impossible to fully scope and define with high confidence all the work necessary for the overhaul of a specific, active ship. Some areas of CVN 68 were not accessible while she was operating or could not be inspected until she was dismantled. Given this uncertainty and the attendant

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5 Five conventional aircraft carriers received service-life extension programs (SLEPs) in the 1980s. As with most of the preceding overhauls, these carriers presented no nuclear issues, but the objectives of the nonnuclear repair and modernization were similar to those for the CVN 68 RCOH.

6 Furthermore, the budget for the CVN 68 RCOH was initially estimated in 1992, six years before the start of execution and at least one year before the planning actually began.
budget and schedule risk, PEO Aircraft Carriers was faced with the challenge of planning for and efficiently managing emergent work throughout the course of execution.

The planning effort started approximately five years prior to the start of execution, with the RCOH nominally set to last 33 months. This five-year planning period is long enough that conditions in the shipyard might also change significantly. There could be changes in the yard’s total workload or in the mix and skill levels of workers assigned to various projects; there could be labor problems. And these could be precipitated by events external to the RCOH. As it turned out, NNS experienced a significant labor strike that affected the CVN 68 RCOH (see Appendix B). In addition, NNS reorganized its carrier-overhaul management twice after the start of the RCOH.

PEO Aircraft Carriers faced further challenges in flexibly managing its relationship with the contractor. For example, NNS works mostly on single-unit, large-ticket items for the Navy that have large, slowly changing, and predictable workforce demands and take long periods of time to complete. The shipyard’s internal processes, contracting metrics, and labor-management practices are understandably optimized for that type of work. This business situation limits the yard’s flexibility in responding to the faster pace and dynamic nature of carrier overhauls.

NNS is also the only shipyard currently capable of building aircraft carriers and has built all of the Nimitz-class carriers as well as all other carriers commissioned in the past 40 years.7 Norfolk Naval Shipyard and Puget Sound Naval Shipyard can refuel nuclear ships and have drydocks large enough to hold aircraft carriers. However, they currently do not have the facilities to refuel a Nimitz-class carrier, nor do they have the workforce to accomplish the majority of the nonnuclear repair work. Therefore, NNS is designated as the yard responsible for all nuclear refuelings of aircraft carriers.8

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7The New York Naval Shipyard built the USS Independence (CV 62) and the USS Constellation (CV 64), both commissioned more than 40 years ago. The USS Kitty Hawk (CV 63) was launched by the New York Shipbuilding Corporation in 1960. These were the last U.S. carriers built by yards other than NNS.

8NNS is also responsible for all CVN 65 availabilities. Either Norfolk Naval Shipyard or Puget Sound Naval Shipyard typically performs the depot-level maintenance for the conventional carriers and the minor availabilities for the Nimitz-class carriers.
PEO Aircraft Carriers has very little competitive leverage with NNS. It is not practical or possible to sustain multiple shipyards capable of constructing and refueling nuclear aircraft carriers. NNS is, therefore, the sole source for these Navy product lines. Performance incentives are also limited by the contracting arrangement. Given the level of uncertainty for an RCOH, a fixed-price (lump-sum) contract strategy would have been inappropriate. A fixed-price contract would place all the risk on the contractor, who would then be forced to build that risk into the contract price, making the RCOH unaffordable to the Navy. Thus, the reasonable contract vehicle was a cost-type contract, with incentives for reduced-cost performance (i.e., charging a lower number of hours to do the work).

**Challenges Arising from the Number of Parties Involved**

The RCOH involved a large number of stakeholders in addition to the program office. These included NNS, various elements of NAVSEA, the NNPP, the TYCOM, and the ship’s force. Each of these organizations had differing, sometimes competing, objectives, which had to be balanced and managed.

Coordination of NNS and the ship’s force would involve particular challenges. The ship’s force would be responsible for executing certain work-package items assigned by the PEO as potentially suitable for them. However, neither the PEO nor NAVSEA would directly control this labor. It would be directed, instead, by the ship’s command. Integrating the two workforces would not be an insignificant task. Furthermore, it was not clear the ship’s force could realistically accomplish the work intended for it (that is, that it would be skilled and qualified to do the work). Finally, the crew has individual and unit training requirements that place demands on its time and availability.

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9Other systems commands, such as the Space and Naval Warfare Command (SPAWAR) and the Naval Air Systems Command (NAVAIR), as well as the requirements managers for various systems on the carrier also were involved in various aspects of the planning and execution of the RCOH.
Internal Staffing Challenges

Another drawback would be the certainty that the PEO and other Navy organizations would face a high staff turnover during the approximately seven-year planning and execution process. The policies and procedures of the Navy would make it unlikely that the officers responsible for the program would be assigned for the life of it (or even half of it). Why might personnel turnover be a problem? Turnover could be expected to lead to rework, redirection, rediscovery, etc., all of which could result in lower efficiency.

As mentioned, PERA-CV, the field activity of PEO Aircraft Carriers that tracked all depot-level availabilities for aircraft carriers and maintained a database of historical repair tasks with their labor and material costs, was dissolved through BRAC. The personnel of PERA-CV were the logical choice for participation in, and potentially even leadership of, the RCOH planning effort. The uncertainty concerning where the PERA-CV personnel would be reassigned resulted in PMS 312D assuming the lead in the planning process. Once a number of the former PERA-CV personnel were attached to SUPSHIP NN, Code 1800, they became more actively involved in the planning for the CVN 68 RCOH (and have taken the lead for the work-package development for subsequent RCOHs). However, this delay at the beginning of the planning process caused difficulties that proved hard to overcome.

An additional staffing-related challenge could have been anticipated from the direction of NAVSEA. In the mid-1990s, while the RCOH planning was under way in earnest, support organizations in the Navy were trimming down, resulting in a loss of capability and experience. This situation was certainly true for NAVSEA. One core capability the Navy lost was its engineering organization’s ability to analyze cost estimates from contractors. Ideally, the Navy would be able to independently estimate work. However, the staffing and effort required to keep such a capability were reduced in the face of budget constraints.10 But would NAVSEA at least be able to maintain

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10SUPSHIP has some capability to evaluate contractor cost estimates. However, this group is rather small and did not have enough time to effectively evaluate the cost estimates for the CVN 68 RCOH.
a cost-analysis division strong enough to review and check proposals from the contractor?

Staffing changes were also occurring at NNS during the execution of the CVN 68 RCOH. One important change was that of the project director for the RCOH. A senior NNS manager with broad experience in the nuclear issues surrounding carrier construction and maintenance assumed leadership when the CVN 68 RCOH program began to falter.

**Changing Maintenance and Administrative Contexts**

The USS *Nimitz* and other nuclear carriers had been through periodic maintenance actions in the shipyard (various types of “availabilities”), as had all the conventional carriers still in the fleet. However, when the USS *Nimitz* was commissioned (1975) and for several years thereafter, the Aircraft Carrier Continuous Maintenance Program governed these maintenance actions. The class was then shifted to the new Incremental Maintenance Program. The USS *Nimitz*’s first availability under the new program was the RCOH. Successful transition to the new maintenance program required removal of the maintenance backlog that had been building for a number of years, but unfortunately, budget constraints resulted in some of that backlog remaining, causing the USS *Nimitz* to be in worse material condition than she should have been upon entering the RCOH.

The CVN 68 RCOH also differed from previous large availabilities for the class in that it was funded within the SCN budget rather than the Operations and Maintenance, Navy (O&MN) budget (the last CVN 65 RCOH was also funded in SCN). Different budgets involve different administrative organizations and procedures.