At some point, the nuclear reactors that power an aircraft carrier run out of the fuel with which they were provided when the carrier was built. For the current Nimitz-class carriers, fuel depletion occurs after about 23 years. Because carriers can last more than 40 years before wear and escalating maintenance costs warrant their retirement, they are refueled when they run out. At the same time a ship is refueled, it is given a complex overhaul in which broken or worn parts are repaired or replaced and systems are modernized. The focus of the modernization is twofold: First, the ship’s combat systems and warfighting capabilities are upgraded to the standard required for deployment after the refueling/complex overhaul (RCOH). Second, its distribution systems (e.g., potable water, aircraft fueling, electric distribution, and air conditioning) are significantly upgraded, and allowance is made for future upgrades over the ship’s remaining operational service life.

On May 29, 1998, the USS Nimitz, designated CVN 68, the first ship of its class, entered the shipyard at the U.S. Navy’s carrier construction contractor, Newport News Shipbuilding (NNS),1 for its RCOH (see Appendix A for a full chronology and work schedule). Given the size of an aircraft carrier and the number of systems and subsystems it has, an RCOH is extremely complex, costly, and time-consuming. When CVN 68 departed the shipyard in the middle of 2001, the total

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1Since the completion of the CVN 68 RCOH, Northrop Grumman has acquired Newport News Shipbuilding. The company is now known as Northrop Grumman Newport News. Throughout this report, we use the original name, Newport News Shipbuilding.
RCOH planning and execution expenditure amounted to over $2.2 billion. The scope of the project was not a surprise, but the schedule did slip by several months, the cost of the nonnuclear portion of the execution contract grew by approximately 20 percent over the negotiated contract price, some desired overhaul tasks were not authorized, and some work was moved to the post-shakedown availability/selected restricted availability (PSA/SRA), immediately following the RCOH.

Construction has started on the tenth and final ship in the Nimitz class. Thus, according to current plans, nine more Nimitz-class ships will undergo midlife RCOHs. Each RCOH is planned to take almost three years, so there will be a carrier undergoing an RCOH almost continuously over the next 25 years. The second ship of the class, CVN 69, has already entered the shipyard, and planning for the CVN 70 RCOH is well under way. The Navy thus has much to gain from restraining cost growth and reducing schedule slippage in future RCOHs. These benefits go beyond budget compliance and operational schedule. Cost and schedule growth can make it difficult or impossible to fund or complete some tasks, leaving a ship at least temporarily at lower capability than desired.

In this report, we analyze the planning for and execution of the CVN 68 RCOH. We examine cost data to determine more precisely the extent and sources of cost growth, and we seek to identify changes in policies, procedures, methods, and technologies that would help the Navy manage the remaining RCOHs more effectively.

Our analysis concentrates on the nonnuclear portion of the RCOH; as we will discuss, the nuclear portion of the CVN 68 RCOH appears to have been accomplished within, or even below, the original contract cost.

As we conducted the research, the estimates of final RCOH costs were constantly changing and being updated to reflect testing results, changing technology, and authorized growth. Our estimates of cost growth are based on the most current data available from the Navy and from NNS at the time this report was written, as well as on many interviews with the parties involved. The costs of the CVN 68 RCOH will not be finalized until the ship completes its PSA/SRA, when many of the combat-system modernization actions will be ac-
accomplished. However, enough information is available to support effective analysis of the key issues.

After providing some background on the issues and institutions involved (Chapter Two), we review the processes by which the CVN 68 RCOH was budgeted, planned, and contracted (Chapter Three). We analyze the RCOH costs to determine their components and the reasons for their growth (Chapter Four). We then identify ways in which management of RCOH planning and execution fell short of good practices and might thus have contributed to higher costs and a longer schedule than necessary (Chapter Five). The report concludes with suggestions for steps that might result in more-efficient RCOHs in the future (Chapter Six).