



September 2017

NAVAL SHIPYARDS

Actions Needed to Improve Poor Conditions that Affect Operations

GAO Highlights

Highlights of [GAO-17-548](#), a report to congressional committees

Why GAO Did This Study

The Navy's four public shipyards—Norfolk Naval Shipyard, Portsmouth Naval Shipyard, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility—are critical to maintaining fleet readiness and supporting ongoing operations involving the Navy's nuclear-powered aircraft carriers and submarines. The condition of these facilities affects the readiness of the aircraft carrier and submarine fleets.

Senate Report 114-255, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2017, included a provision for GAO to examine the capital investment in and performance of the Navy's shipyards. GAO evaluated (1) the state of the naval shipyards' capital facilities and equipment, (2) the extent to which shipyard capital facilities and equipment support the Navy's operational needs, and (3) the extent to which the Navy's capital investment plans for facilities and equipment are addressing shipyard challenges. GAO reviewed data from fiscal years 2000 through 2016 on shipyard capital investment and performance and the age and condition of facilities and equipment; reviewed Navy guidance; visited the shipyards; and interviewed Navy and shipyard officials.

What GAO Recommends

GAO recommends that the Navy develop a comprehensive plan to guide shipyard capital investment, conduct regular management reviews, and report to Congress on progress in addressing the shipyards' needs. DOD concurred with all 3 recommendations.

View [GAO-17-548](#). For more information, contact Zina Merritt at (202) 512-5257 or merrittz@gao.gov.

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What GAO Found

Although the Navy committed to increased capital investment and developed an improvement plan in 2013, the shipyards' facilities and equipment remain in poor condition. GAO's analysis of Navy shipyard facilities data found that their overall physical condition remains poor. Navy data show that the cost of backlogged restoration and maintenance projects at the shipyards has grown by 41 percent over five years, to a Navy-estimated \$4.86 billion, and will take at least 19 years (through fiscal year 2036) to clear. Similarly, a Navy analysis shows that the average age of shipyard capital equipment now exceeds its expected useful life.

Partly as a result of their poor condition, the shipyards have not been fully meeting the Navy's operational needs. In fiscal years 2000 through 2016, inadequate facilities and equipment led to maintenance delays that contributed in part to more than 1,300 lost operational days—days when ships were unavailable for operations—for aircraft carriers and 12,500 lost operational days for submarines (see figure). The Navy estimates that it will be unable to conduct 73 of 218 maintenance periods over the next 23 fiscal years due to insufficient capacity and other deficiencies.

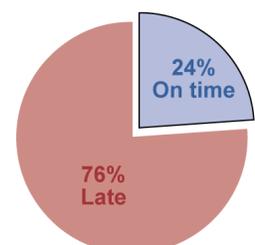
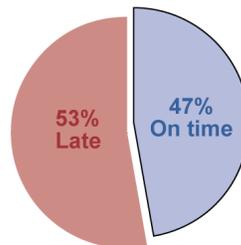
Shipyard Maintenance Delays, Fiscal Years 2000–2016

Aircraft carriers (fiscal years 2000 — 2016) »

Submarines (fiscal years 2000 — 2016) »

25 of 53 on schedule

42 of 173 on schedule



Source: GAO analysis of Navy data. | GAO-17-548

Note: Aircraft carrier data are incomplete for fiscal year 2016, and submarine data are incomplete for fiscal years 2014 through 2016. Both will likely be higher once these data are complete.

Though the Navy has developed detailed plans for capital investment in facilities and equipment at the shipyards that attempt to prioritize their investment strategies, this approach does not fully address the shipyards' challenges, in part because the plans are missing key elements. Missing elements include analytically-based goals and metrics, a full identification of the shipyards' resource needs, regular management reviews of progress, and reporting on progress to key decision makers and Congress. For example, the Navy estimates that it will need at least \$9.0 billion in capital investment over the next 12 fiscal years, but this estimate does not account for all expected costs, such as those for planning and modernizing the shipyards' utility infrastructure. Unless it adopts a comprehensive, results-oriented approach to addressing its capital investment needs, the Navy risks continued deterioration of its shipyards, hindering its ability to efficiently and effectively support Navy readiness over the long term.

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Abbreviations

CNIC	Commander, Navy Installations Command
DOD	Department of Defense
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
OPNAV	Office of the Chief of Naval Operations

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September 12, 2017

Congressional Committees

The Navy's public shipyards are critical to maintaining the readiness of its fleet, including nuclear aircraft carriers and submarines, and supporting ongoing operations around the world. The four shipyards—Norfolk Naval Shipyard in Virginia, Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility in Hawaii, Portsmouth Naval Shipyard in Maine, and Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Washington—provide the Navy with the capability to perform depot- and intermediate-level maintenance on ships, emergency repairs, ship modernization, and ship deactivations. The Navy annually requests funds from Congress for capital investment in the shipyards to maintain their ability to support its warfighting capabilities. Over the last 5 fiscal years, the Navy has spent about \$1.9 billion on capital investment at its shipyards. As of June 2017, the Navy operated 276 ships, including the 10 aircraft carriers and 70 submarines that are predominately maintained by the naval shipyards.

In 2010, we reported that the Navy's planned investment levels for its shipyards might not be adequate to address its estimated backlog of approximately \$3 billion in facility restoration and modernization needs.¹ We also found that the Navy's management processes under stated shipyard needs, led to delays in the shipyards requesting and completing projects, and did not track the extent to which the shipyards resolved facility-related safety, health, and quality-of-life issues. We recommended that the Navy develop guidance to standardize shipyard strategic planning, improve processes for developing restoration and modernization requirements, and document the resolution of quality-of-life issues that have been identified. The Department of Defense (DOD) concurred with our recommendations and addressed them by, for example, providing guidance to the shipyards that required them to develop strategic plans to address their future restoration and modernization needs and improving its collection of facility data to support restoration and modernization requirements. In 2013, in response to congressional direction, the Navy developed a plan to improve most of its

¹GAO, *Defense Infrastructure: Actions Needed to Improve the Navy's Processes for Managing Public Shipyards' Restoration and Modernization Needs*, [GAO-11-7](#) (Washington, D.C.: November 16, 2010).

shipyard facilities and estimated it would take 17 years (until 2030) to fully clear the backlog of maintenance and infrastructure repair that existed at the time.² The Navy's improvement plan sought to improve the condition of critical shipyard facilities and utilities, mitigate seismic risks to the drydocks, and centralize different maintenance operations in specific areas of the naval shipyards to reduce time spent in transit between support facilities and the waterfront where maintenance occurs on the ship. It also sought to address failing utilities to prevent depot maintenance operations from being degraded or disrupted.

Senate Report 114-255, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2017, included a provision for us to examine aspects of the Navy's planning for capital investment in its shipyards and the shipyards' ability to support the Navy's operational readiness.³ In this report, we assess (1) the state of the naval shipyards' capital facilities and equipment, (2) the extent to which shipyard capital facilities and equipment support the Navy's operational needs, and (3) the extent to which the Navy's capital investment plans for facilities and equipment are addressing shipyard challenges. We also discuss in appendix I the Navy's transition from the use of a working capital fund to a direct funding mechanism to fund shipyard operations beginning in 1997, and Navy officials' views about the effects of this transition, if any, on capital investment planning or shipyard performance.⁴ This report focuses on the four naval, or "public," shipyards; these are operated by the U.S. Navy, in contrast to the private-sector shipyards that also support the U.S. Navy. The four naval shipyards are focused almost exclusively on conducting repair and refueling work on the Navy's nuclear-powered aircraft carriers and submarines.⁵ Private shipyards contract with the

²Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013).

³S.Rep.No.114-255, at 121 (2016).

⁴For purposes of this report, we use "direct funding" to refer to amounts allotted by the Navy in support of shipyard activities out of its annual appropriations. Congress generally provides direction to the Navy in conference reports or explanatory statements accompanying annual appropriations acts on amounts to be allotted for specific shipyard activities. The naval shipyards transitioned to direct funding at different times. Pearl Harbor made the change in fiscal year 1998, Puget Sound in fiscal year 2004, and Norfolk and Portsmouth in fiscal year 2007.

⁵The naval shipyards are capable of repairing and modernizing surface combatant ships and do so in limited cases, though in practice they focus primarily on aircraft carriers and submarines.

Navy to conduct the bulk of the repair work on the Navy's surface combatants and amphibious warfare ships.⁶

To assess the state of the shipyards' facilities and equipment, we reviewed Navy data regarding the age, condition, and mission criticality of shipyard facilities, equipment, and drydocks collected from fiscal year 2013 through fiscal year 2016.⁷ We also reviewed data on facilities restoration and modernization backlogs from fiscal year 2011—the last time we reviewed this matter—through fiscal year 2016, the latest year for which data were available at the time of our review. We analyzed budget justification data on shipyard capital investment from fiscal years 2007 through 2017 to determine overall spending trends.⁸ Throughout this report, we present budget data in both nominal and inflation-adjusted dollars. To adjust the dollars for inflation, we used the fiscal year gross domestic product index with fiscal year 2016 as the base year. We also analyzed Navy documents on capital facilities and equipment, including budget memoranda, project proposals, and Navy capital investment guidance. We visited the four naval shipyards to observe operations and the condition of the facilities and equipment and to interview officials about how the condition of the facilities and equipment was affecting operational efficiency and performance.

To determine the extent to which shipyard capital facilities and equipment support the Navy's operational needs, we analyzed Navy data on shipyard cost and schedule performance, including lost operational days due to maintenance delays from fiscal year 2000 through fiscal year 2016. We also assessed Navy documents on the future capacity and capability of shipyard drydocks and interviewed Navy officials on future plans.

To determine the extent to which the Navy's capital investment plans and management approach for facilities and equipment are addressing shipyard challenges, we analyzed plans issued from fiscal year 2010—

⁶GAO, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, [GAO-16-466R](#) (Washington, D.C.: May 2, 2016).

⁷The Navy's Mission Dependency Index describes the relative importance of facilities in terms of mission criticality. This index goes from 1 to 100; facilities with ratings of 85 and above are considered by the Navy to be the most critical facilities.

⁸This is the period of time for which comparable data were available from all four shipyards. Prior to 2007, some naval shipyards were operating under a working capital fund mechanism, so the funding was not comparable.

the last time we reviewed this matter—through March of fiscal year 2017 from each shipyard and from Naval Sea Systems Command (NAVSEA). We compared the plans and management of shipyard capital investment to key elements of a results-oriented management approach that had been identified from our prior work as critical to successful strategic planning, and we determined whether these plans and the Navy’s management approach included those key elements.⁹ We reviewed Office of the Secretary of Defense and Navy guidance on sustainment, investment spending, and facilities planning, as well as documentation on shipyard capital investment challenges, facilities planning projects, and equipment usage.

To describe the Navy’s transition from funding shipyards through a working capital mechanism to direct funding during fiscal years 1998 through 2007, we reviewed Navy documentation on the transition, including after-action reports on lessons learned from pilot efforts. We analyzed annual Navy budget justification data on capital investment spending from fiscal year 2007—the first year all shipyards were under the direct funding mechanism—through fiscal year 2017. We also interviewed Navy shipyard officials who had operated under both funding mechanisms, to learn about the different incentives and operating procedures under each.

To address all of our objectives, we interviewed or obtained documentation from the Office of the Under Secretary of Defense, Comptroller; the Office of the Under Secretary of Defense for Personnel and Readiness; Headquarters, the Department of the Navy; U.S. Fleet Forces Command; the Commander, Navy Installations Command (CNIC); Naval Facilities Engineering Command (NAVFAC); Naval Sea Systems Command, Logistics, Maintenance and Industrial Operations; Naval Sea Systems Command, Nuclear Propulsion; Norfolk Naval Shipyard; Portsmouth Naval Shipyard; Puget Sound Naval Shipyard and

⁹See GAO, *Managing For Results: Data-Driven Performance Reviews Show Promise But Agencies Should Explore How to Involve Other Relevant Agencies*, [GAO-13-228](#) (Washington, D.C.: Feb. 27, 2013); *DOD’s 2010 Comprehensive Inventory Management Improvement Plan Addressed Statutory Requirements, But Faces Implementation Challenges*, [GAO-11-240R](#) (Washington, D.C.: January 7, 2011); *Results-Oriented Management: Strengthening Key Practices at FEMA and Interior Could Promote Greater Use of Performance Information*, [GAO-09-676](#) (Washington, D.C.: Aug. 17, 2009); *Managing For Results: Enhancing Agency Use of Performance Information for Management Decision Making*, [GAO-05-927](#) (Washington, D.C.: Sept. 9, 2005); and *Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers*, [GAO/GGD/AIMD-99-69](#) (Washington, D.C.: Feb. 26, 1999).

Intermediate Maintenance Facility; and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility.

To assess the reliability of the data to address the objectives in this report, we reviewed systems documentation and interviewed officials to understand system operating procedures, organizational roles and responsibilities, and error checking mechanisms. We also conducted our own error checks to look for inaccurate or questionable data and discussed with officials any data irregularities we found. We conducted these assessments on the following systems: the Facility Readiness Evaluation System (for data on the Navy's restoration and modernization backlog from fiscal year 2011 through fiscal year 2016), the internet Navy Facility Asset Data Score (for data on facility condition, criticality, and replacement cost from fiscal year 2013 through fiscal year 2016), the electronic Facilities and Equipment Management system (for data on equipment repair requests from fiscal year 2008 through fiscal year 2016), the Defense Property Accountability System (for data on the age of capital equipment), and the Navy Modernization Process (for data on maintenance timeliness and lost operational days from fiscal year 2000 through fiscal year 2016). We found the data that we used from these systems to be sufficiently reliable for the purposes of summarizing trends in the selected shipyard and facility metrics reported.

We conducted this performance audit from June 2016 to September 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

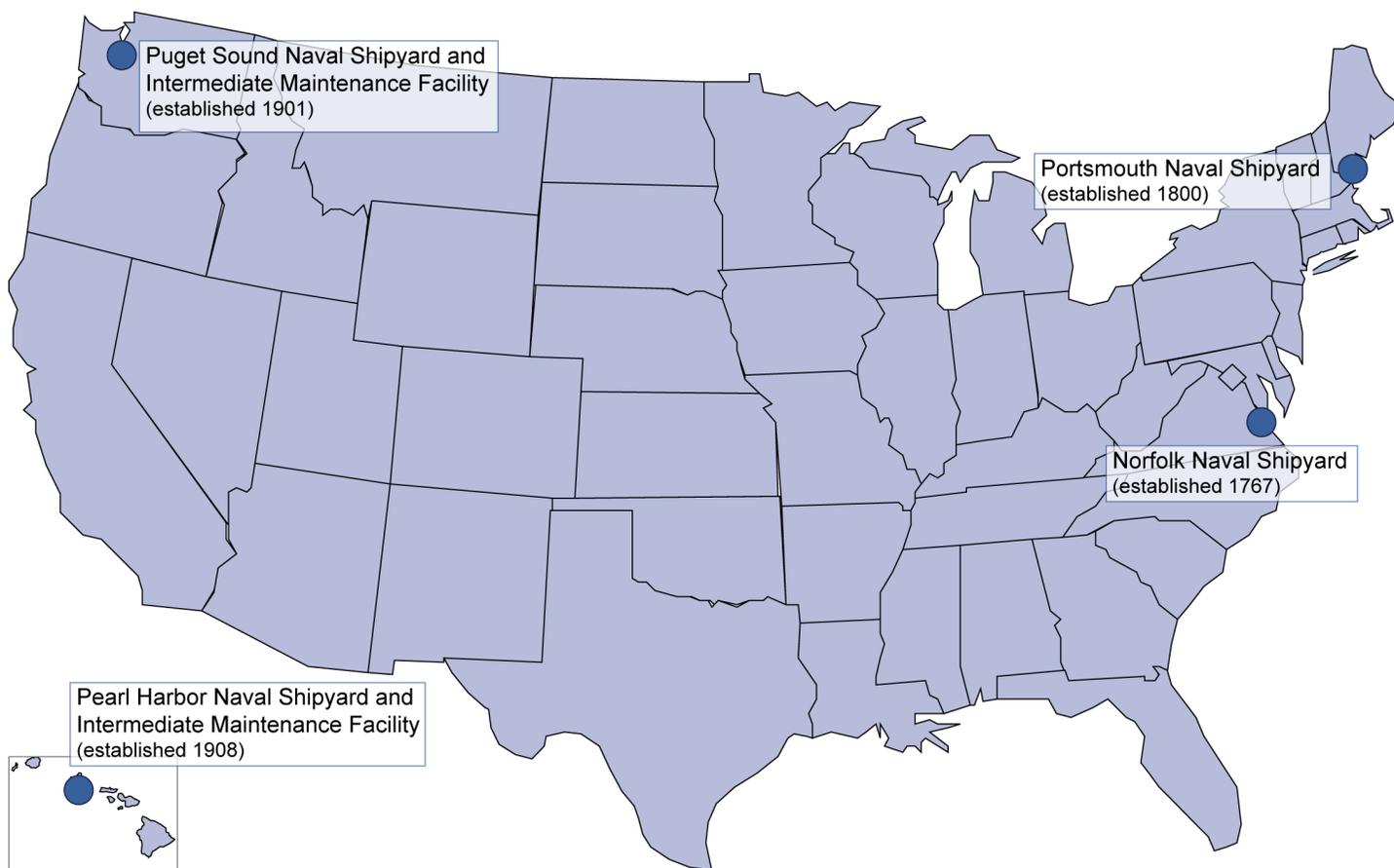
Background

History and Purpose of the Naval Shipyards

The naval shipyards are highly industrialized, large-scale operations that provide maintenance for ships and submarines. The naval shipyards are essential to national defense and fulfill the legal requirement for the Department of Defense to maintain a critical logistics capability that is government owned and operated to support an effective and timely response for mobilization, national defense contingency situations, and other emergency requirements. The naval shipyards were designed to build wind- and steam-powered ships, which reduces their efficiency in

repairing today's modern nuclear-powered ships. They range in age from 109 years to 250 years (see figure 1).

Figure 1: Map of Naval Shipyards as of 2017



Sources: Map Resources and Navy documents. | GAO-17-548

The naval shipyards provide depot-level maintenance, which involves the most comprehensive and time-consuming maintenance work, including ship overhauls, alterations, refits, restorations, nuclear refuelings, and deactivations—activities crucial to supporting Navy readiness. This maintenance is performed during periods designated in the Navy's Optimized Fleet Response Plan, a carefully orchestrated operational schedule of maintenance, training, and deployment periods for the entire fleet. It is designed to maximize the fleet's operational availability to combatant commanders while ensuring adequate time for training and maintenance. We reported in 2016 that successful implementation of the

Optimized Fleet Response Plan depends, in part, on the shipyards completing maintenance on time and that maintenance delays reduce the time that ships are available for training and operations.¹⁰ This means it is essential to the Navy’s ability to maintain readiness and support operational needs that the shipyards be as efficient as possible.

Capital Investment at the Shipyards

Capital investment refers to expenditures for shipyard facilities and equipment, including the repair, construction, and maintenance of real property, among other activities.¹¹ Capital investment projects at Navy facilities are funded primarily through Military Construction and Operation and Maintenance appropriations.¹²

- **Military Construction projects** are construction, development, conversion, or extension projects of any kind, including repair work. Military Construction appropriations are used to fund projects costing more than \$1 million, while Operation and Maintenance funds are used for projects costing less than \$1 million.
- **Special projects** are restoration and modernization projects with funded costs exceeding \$750,000 in which the portion of work that is classified as construction is under \$1 million. Operation and Maintenance funds are used for special projects.
- **Equipment projects** are those associated with the installation of equipment in facilities.¹³ Where non-structural work—including the provision of the equipment—is required on real property, the project is financed with funds supporting the procurement of the equipment. Where structural changes are required, those costs are classified and funded as construction.

¹⁰GAO-16-466R.

¹¹Office of the Chief of Naval Operations Instruction (OPNAVIST) 11010.20H, *Navy Facilities Projects*, chap. 1, § 2(d) (June 24, 2015). For the purposes of this report, “shipyard facilities” refers to all structures (such as buildings and bridges) owned or operated by the shipyards, as identified by the internet Navy Facility Asset Data Score system.

¹²Some repair or maintenance projects are funded through Procurement and Research, Development, Test and Evaluation appropriations or the Navy Working Capital Fund.

¹³Personal property—items not required for the operation of the real property facility but for the functional operation and activities utilizing the facility, such as industrial plant equipment—is included as well. For the purposes of this report, both personal and real property equipment will be referred to as “capital equipment.”

The Navy acknowledges that there has been a history of under-investment in shipyard restoration and modernization needs.¹⁴

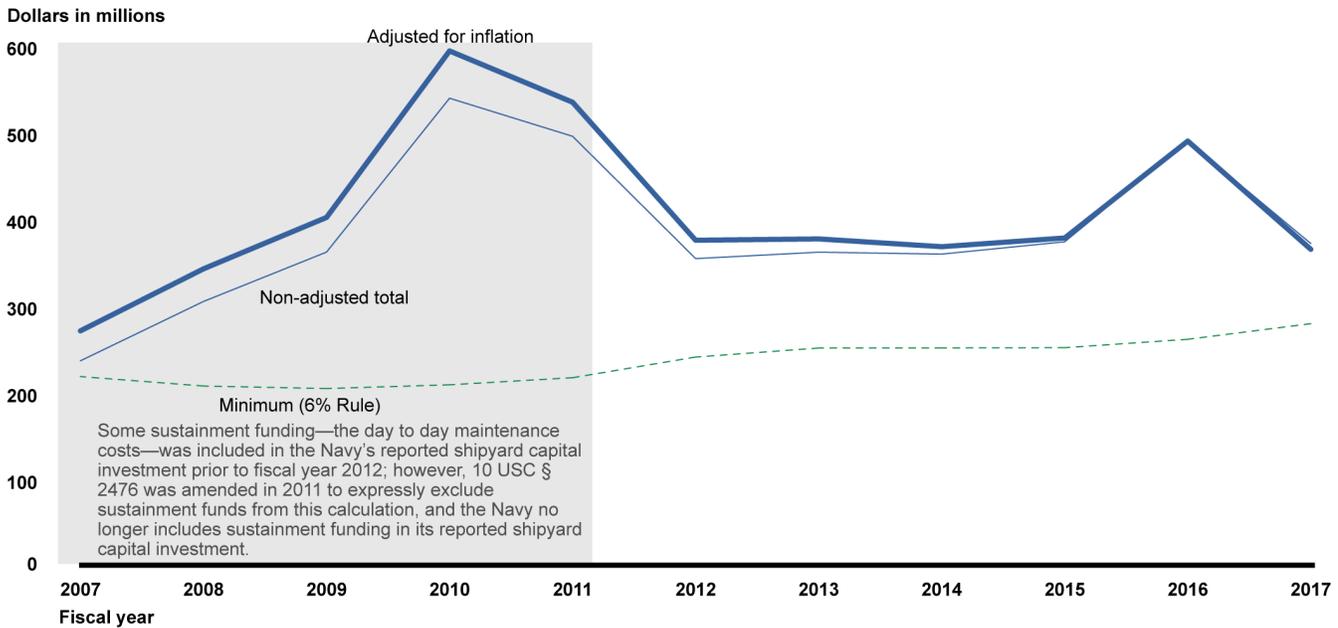
Recognizing this issue, Congress passed a law in fiscal year 2007 that requires the Secretary of the Navy to invest in the capital budgets of the Navy depots a total amount equal to not less than 6 percent of the average total combined maintenance, repair, and overhaul workload funded at all the Navy depots for the preceding three fiscal years.¹⁵ In fiscal year 2008, the Navy committed to increased capital investment to comply with the law and to improve the overall material condition of these facilities. In 2013, pursuant to a statutory mandate, the Navy developed a plan to improve its shipyard facilities and estimated that it would take 17 years (until fiscal year 2030) to resolve the backlog of maintenance and infrastructure repair that existed at the time.¹⁶ Since fiscal year 2007, total shipyard capital investment has increased by about 35 percent in inflation-adjusted 2016 dollars, as shown in figure 2. Capital investment at the shipyards has increased at a pace similar to that of overall shipyard funding, which has increased by about 34 percent over the same period, after adjusting for inflation.

¹⁴Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013).

¹⁵John Warner National Defense Authorization Act for Fiscal Year 2007, Pub. L. No. 109-364, § 332(a) (2006), classified at 10 U.S.C. § 2476. This is also referred to as the “6 Percent Rule.”

¹⁶Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013). This report was developed in response to a statutory mandate in the National Defense Authorization Act for Fiscal Year 2012, Pub. L. No. 112-81, § 2865 (2011).

Figure 2: Total Shipyard Capital Investment, Nominal and Inflation-Adjusted, with 6 Percent Investment Minimum, Fiscal Years 2007 – 2017



Source: GAO analysis of Navy budget documents from fiscal years 2009 through 2018. | GAO-17-548

Note: Inflation adjustment was figured with the fiscal year gross domestic product index, using fiscal year 2016 as the base year. Fiscal year 2007 and 2008 figures are estimates, because no actual figures were reported for those years, and the fiscal year 2017 amount is projected, because the fiscal year is not complete. The 6 Percent Rule in statute requires that the Navy spend an amount on capital investment equal to the total of the average combined maintenance, repair, and overhaul workload funded at all the Navy depots, which include the shipyards, Navy Fleet Readiness Centers, and Marine Corps Production Plants. The 6 percent line denoted here was identified by the Navy as the shipyards’ portion of the Navy’s 6 percent requirement, although the shipyards could spend more or less than this amount without necessarily meeting or failing to meet the requirements of the statute. The two peaks in the chart are each the result of an individual project—a Norfolk pier improvement project accounts for most of the peak in fiscal years 2010 and 2011, and a Norfolk waterfront utility project accounts for about half of the peak in fiscal year 2016.

Management of Capital Investment in the Shipyards

A number of Navy organizations have a role in determining the level of capital investment to be made in the shipyards (see figure 3). The Office of the Chief of Naval Operations (OPNAV) allocates the funding for overall capital investment in the shipyards. Naval Sea Systems Command (NAVSEA) determines which capital investment projects are most critical to enable the shipyards to continue operations. Those projects are planned by personnel from Naval Facilities Engineering Command (NAVFAC), using funds provided by the Commander, Navy Installations Command (CNIC). The projects then go through the Shore Mission Integration Group process, led by CNIC, where they compete against

other Navy priorities for funding. The group reviews proposed shipyard projects to determine whether they are necessary and appropriate and then prioritizes them. After all the proposed projects have gone through this process, the result is a ranked list of approved projects; the Navy then allocates funds for those projects in priority order until it reaches the funding level set by OPNAV.

Figure 3: Organizations Involved In the Management of Shipyard Capital Investment



Source: GAO analysis of Navy documents and discussions with Navy officials. | GAO-17-548

Shipyard Facilities and Equipment Are in Poor Condition

Although the Navy has committed to increasing shipyard capital investment and implementing improvement plans, the physical condition of the shipyards' facilities remains poor according to Navy data, and the cost to address restoration and modernization backlogs is increasing.¹⁷ For example, we estimate that it will take at least 19 years to clear the backlog (through fiscal year 2036), 6 years longer than the Navy estimated in 2013. Meanwhile, the shipyards' drydocks also require restoration and modernization. The average age of capital equipment at

¹⁷For more on capital investment and current performance at specific shipyards, please see appendixes II through V.

the shipyards exceeds its expected useful life, and the overall condition of this equipment may be deteriorating.

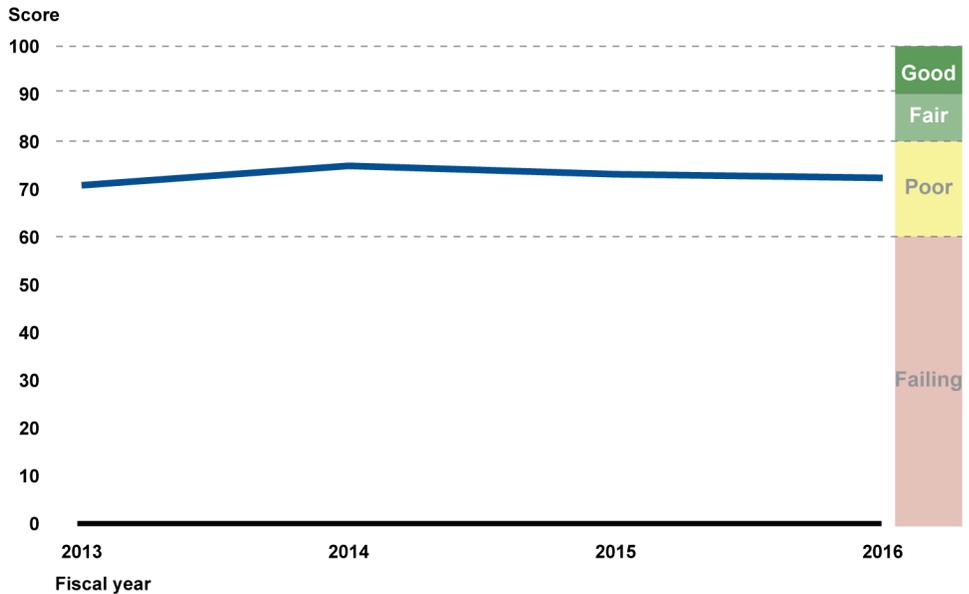
Shipyard Facilities Are in Poor Condition

GAO's analysis of data on Navy facilities found that the average rating for the overall condition of facilities at the Navy's four shipyards remains poor.¹⁸ Specifically, the shipyards' average condition rating—which measures the physical condition of a facility—has remained essentially flat and in the “poor” category, with an average rating of 71 in fiscal year 2013 and an average rating of 72 at the end of fiscal year 2016 on the 100 point scale used by the Navy (see figure 4).¹⁹ Moreover, in fiscal year 2016 the Navy rated about 25 percent of all shipyard facilities below 60, and therefore categorized them as being in failing condition. Furthermore, as of fiscal year 2016, the Navy categorized one in every five failing naval shipyard facilities as a facility that was critical to accomplishing the shipyard's repair mission.

¹⁸A facility's condition rating indicates NAVFAC's assessment of the physical condition of the facility with a rating from 0 to 100, in which 0 denotes that the facility's physical condition is failing and 100 denotes that the facility is in excellent physical condition. The condition rating is a quality rating expressed as a comparison between the cost of repairing a facility to like-new condition and the cost of fully replacing that facility. Facilities with a rating between 60 and 79 are considered “poor,” while those with a rating below 60 are considered failing.

¹⁹We also assessed the condition ratings of the Navy's mission-critical facilities separately, but we found that those ratings generally mirrored the overall averages. The Navy's Mission Dependency Index describes the relative importance of facilities in terms of mission criticality. This index ranges from 1 to 100; the Navy considers facilities with ratings of 85 and above to be the most critical facilities. The condition ratings of the Navy's most mission-critical shipyard facilities have remained essentially flat, with an average rating of about 72 in fiscal year 2013 and an average rating of about 73 in fiscal year 2016.

Figure 4: Average Weighted Condition Ratings of Shipyard Facilities by Year, Fiscal Years 2013 – 2016, with Navy Rating Categories



Source: GAO analysis of Navy data. | GAO-17-548

Note: The Navy weights its average condition ratings by the replacement cost of the building, also known as the plant replacement value. This is to ensure that costlier facilities are weighted more heavily in the condition ratings, so that a large, critical shop plant is weighted as more important than a small, less critical facility, for example. There are other ways to calculate the average condition ratings of shipyard facilities, such as using a simple average or weighting by the criticality of the facility. However, each of these methods has potential drawbacks, and so for the purposes of this report, we used the same weighting method as the Navy. This rating and its supporting data are collected and tracked by the shipyards and Naval Facilities Engineering Command in the internet Navy Facility Asset Data Score system.

Navy data also suggest that the shipyards may have about 1.2 million square feet of condemned, uninhabitable, or otherwise unusable facility space.²⁰ According to Navy data, four dozen shipyard buildings across the four shipyards have been condemned or are unusable for ship repair activities, including some in prime waterfront locations that shipyard officials said could be used to improve the efficiency of ship repair processes. Navy shipyard officials noted that the shipyards were not designed for their current mission and that the layout, size of facilities, pier space, utilities, and safety systems contribute to reducing the

²⁰In addition, the naval shipyards use different attributes to categorize spaces or facilities as condemned, uninhabitable, or unusable. For the purposes of providing summary statistics, we relied on the shipyards' respective definitions.

efficiency of the shipyards for repair work. The Navy has reported that the inefficiencies of the current layout limit the yards' abilities to improve their cost and schedule performance. For example, shipyard officials at Puget Sound stated that workers conducting ship repair work cannot traverse one shop building end-to-end without changing floors.

The Navy has other measures it uses to assess facilities, in particular the facility configuration rating. This rating measures the facility's suitability to function as intended or required for its mission.²¹ However, we did not assess the average configuration of the shipyard facilities, because the Navy had not resolved an issue concerning the reliability of the configuration data that we identified in 2011. Specifically, the configuration rating in the Navy's database defaults to 100 when no rating has been entered into the system.²² Our analysis of the Navy's fiscal year 2016 configuration data showed that 928 of 1300, or 71 percent, of the facilities had ratings of 100. Shipyard officials told us that most of these ratings were likely the result of a default rating and did not represent actual assessments. As we previously described, this use of a default rating creates a false result that suggests these facilities are perfectly configured, when in reality their status has not been assessed or recorded in the Navy's database. This false result also has the effect of underestimating shipyard restoration and modernization costs, since the configuration ratings are used to inform these estimates. Given these concerns about the reliability of the configuration ratings, we did not determine trends in the average configuration of shipyard facilities since the Navy began implementing its 2013 facilities plan. We recommended in 2011 that the Navy develop a plan to ensure the accuracy of its condition and configuration data, but as of July 2017 the Navy's plan had not corrected the issue with the configuration data. We believe our earlier recommendation remains valid.

²¹Navy officials said the configuration rating can change as the facility's mission changes but also as building codes are revised, user requirements change, or facility components become obsolete.

²²[GAO-11-7](#).

Facility Maintenance Backlogs Are Increasing

The shipyard facilities' restoration and modernization backlog has continued to grow over the past 5 fiscal years.²³ The Navy defines its restoration and modernization backlog as the estimated costs to restore facilities degraded by inadequate sustainment, excessive age, natural disaster, fire, or accident, among other things; to renovate or replace existing facilities to implement new or higher standards or accommodate new functions; or to replace building components that typically last more than 50 years.²⁴ According to CNIC estimates, the funding required to eliminate the facilities restoration and modernization backlog at the four shipyards increased by 41 percent between fiscal year 2011 and fiscal year 2016, from a \$3.45 billion backlog to a \$4.86 billion backlog.²⁵ For comparison, CNIC officials told us that the entire Navy facilities restoration and modernization backlog over the same period increased at a slower pace of about 14 percent, from a backlog of \$37.45 billion in fiscal year 2011 to a backlog of \$42.87 billion in fiscal year 2016.

Given the current average funding levels for capital facilities that the shipyards have received from the Navy of approximately \$260 million per year, we calculated that it would take the Navy at least 19 years (through fiscal year 2036) to eliminate the \$4.86 billion backlog of facilities restoration and modernization that the shipyards faced at the end of fiscal year 2016.²⁶ This contrasts with the estimated 17 years (through fiscal year 2030) that the Navy estimated it would take to eliminate the

²³The Navy calculates its restoration and modernization backlog through the Facility Readiness Evaluation System, which assesses data for all Navy installations, including the four shipyards. In the mathematical formula used to calculate total restoration and modernization backlog, configuration rating data are used to calculate modernization costs, condition rating data are used to calculate restoration costs, and facility replacement value is used as a weighting factor. Due to the methods the Navy uses to calculate the configuration rating, the restoration and modernization backlog may be understated.

²⁴Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013).

²⁵Officials stated that the backlog increased due to several factors including: sustainment funding not keeping pace with needs, restoration and modernization funding being below requirements, and costs arising from regulatory requirements.

²⁶The average funding level of \$260 million per year for capital facilities was calculated by taking the average of the naval shipyard military construction funding and facilities, sustainment, restoration and modernization funding from fiscal year 2007 to fiscal year 2017. The funding level for fiscal year 2017 is an estimate. Facilities sustainment, restoration and modernization funding contains funding for sustainment, which does not address facility restoration and modernization needs. Therefore, it would likely take longer than the 19 years to address the shipyards' restoration and modernization backlog.

shipyards' restoration and maintenance backlog at the time it published its shipyard improvement plan in 2013. Further, NAVSEA officials told us that addressing this restoration and modernization backlog does not build additional shipyard capacity and capability—it only allows the shipyards to remain at their present levels of capacity and capability. Any new or emergent mission requirements would further increase the time required to clear the shipyards' facilities restoration and maintenance backlog, according to NAVSEA officials.

Drydocks Require Restoration and Modernization

We found that the shipyards' drydocks have a number of unaddressed restoration and modernization needs. Maintenance personnel use drydocks to safely access the underside of ships and submarines, and drydocks are among the most critical facilities at the shipyards. The shipyards rely on 18 aged drydocks to perform maintenance on the Navy's current fleet of aircraft carriers and submarines. Our analysis of Navy data shows that the average age of Navy drydocks is about 89 years.²⁷ The oldest drydock in current use was completed in 1891 and the newest was completed in 1962. Aging drydocks pose risks to the shipyards' ability to perform their depot repair mission uninterrupted and ultimately to the Navy's ability to provide required aircraft carrier and submarine presence to combatant commanders. These risks result from flooding and seismic vulnerabilities and the potential for aging drydocks to deteriorate, among other things. Examples of key drydock shortcomings identified by the Navy include obsolescence, flooding vulnerabilities, and seismic vulnerabilities.

²⁷In determining the average age of shipyard drydocks, we excluded Drydock 1 from Norfolk Naval Shipyard, which was built in 1833, because it is not capable of supporting maintenance on nuclear-powered aircraft carriers or submarines.

Workarounds for Drydock Obsolescence

Three of Puget Sound's six drydocks and one of Norfolk's five drydocks require the use of superflooding as a workaround to service the Navy's current fleet of submarines.

Superflooding forces water into the drydock to raise the water level higher than the tides to obtain the necessary clearance for the submarine to move into the dock. According to shipyard officials at Puget Sound, superflooding can result in the flooding of drydocks' electrical and service galleries (shown below), which were not designed to be flooded and therefore have to be repaired because of rust and seawater corrosion.



Source: GAO. | GAO-17-548

Additionally, Drydock 1 at Portsmouth Naval Shipyard and Drydock 3 at Pearl Harbor require buoyancy assistance equipment to provide additional lift to reduce the submarine's waterborne draft to move it into the drydock. In its 2017 draft drydock study, the Navy reports that, without the use of buoyancy assistance equipment, these two drydocks could no longer dock any of the Navy's current submarines. While this workaround allows the shipyards to repair some current classes of submarines, the Navy's study says it will not be sufficient in the future for newer classes. Additionally, shipyard officials said that Drydock 3 at Puget Sound can move Los Angeles class submarines in or out only after they have had several tons of weight removed and only during a high tide. This drydock is primarily used for submarine reactor compartment disposal.

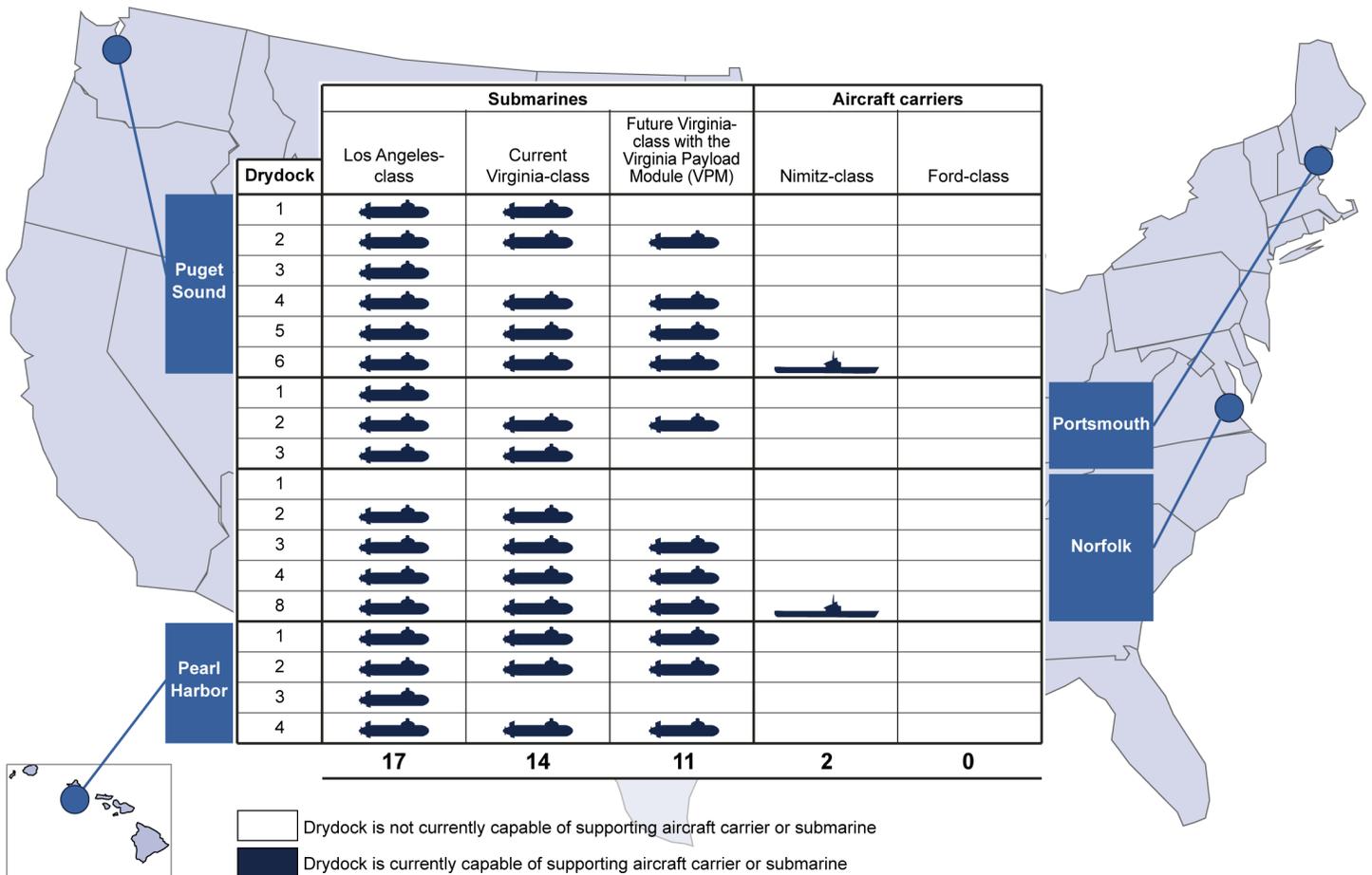
Source: GAO | GAO-17-548

Drydock obsolescence. Several of the shipyards' drydocks are not able to support existing submarine classes, including the Los Angeles-class attack submarine. Other drydocks can support vessels only when assisted by particular equipment or environmental conditions such as tidal schedules (see sidebar). Our analysis shows that as the Navy retires existing aircraft carriers and submarines and replaces them with newer classes, the shipyards will become increasingly constrained in scheduling and performing maintenance using their existing drydocks. Only 11 of the 18 drydocks in use are configured to perform maintenance on the newer ship and submarine classes being procured by the Navy, such as the larger Ford-class aircraft carrier and the Virginia-class submarine (see figure 5). According to a June 2017 draft drydock study from the Navy, without making new investments in drydocks, the shipyards will increasingly encounter scheduling delays waiting for access to the 11 drydocks that are configured for the newer classes.²⁸

Flooding vulnerabilities. Four of Norfolk's 5 drydocks face flooding threats from extreme high tides and storm swells and average one major flooding event per year. According to officials, drydock flooding during certain delicate depot maintenance tasks risks personnel safety, catastrophic damage to the ships being repaired, and potential environmental impacts. For example, the Navy reported in 2009 that a drydock at Norfolk required emergency repairs to prevent flooding while the USS *Tennessee* (SSBN-734) was undergoing maintenance. According to a 2009 Navy incident report, several days of high tides and winds, coupled with multiple leaks in the drydock's granite block joints, resulted in the drydock flooding at an estimated rate of 3,000 gallons per minute before workers could repair it.

²⁸Naval Sea Systems Command, *Naval Shipyard Drydock Capacity and Survivability Study* (June 14, 2017). This document is still in draft format and has not been released.

Figure 5: Naval Shipyard Drydock Maintenance Configuration and Capacity, by Shipyard and Ship Class, as of June 2017



Sources: GAO analysis of Navy documents; Map Resources. | GAO-17-548

Note: The Navy describes similarly designed ships or submarines as a “class”. The class name is derived from the name of the first ship or submarine in the series.

Seismic vulnerabilities. The Navy’s drydocks were not designed to accommodate the risks posed by seismic events. For example, at Puget Sound Naval Shipyard—located in an area identified by the U. S. Geological Survey as a “High Seismic Hazard Zone”—a 7.0 magnitude or greater earthquake could damage or ruin the only drydock on the west coast that is capable of performing maintenance on aircraft carriers. As recently as 2001, the Puget Sound region experienced a 6.8 magnitude earthquake.

Capital Equipment is Aging

According to Navy documentation, shipyards' capital equipment is aging beyond its expected service life and its overall condition appears to be deteriorating, negatively affecting ship and submarine repair work. Capital equipment includes items such as shipyard cranes, sheet metal rollers, plasma cutters, and furnaces. In September 2016, an internal NAVSEA analysis showed that the average age of capital equipment at the four shipyards had risen to 22 years, which is beyond the 15-year average expected useful life that the Navy has calculated for capital equipment. We also observed aging equipment at all four shipyards, including submarine shaft lathes at Puget Sound that had entered service in the 1930s and a plate roller at Portsmouth that was built in the 1950s. This equipment was still being used to support maintenance on modern nuclear submarines and at times has created impediments to efficiently and effectively completing repair work, according to shipyard officials.

Equipment that is beyond its useful life can be inefficient and unreliable, affecting the shipyards' ability to conduct repair work. Our analysis of data on the repair of Navy equipment found that the number of requests for repair of shipyard equipment is trending upward, from about 13,400 in fiscal year 2008 to about 17,100 in fiscal year 2016, an increase of about 28 percent. This indicates that the shipyards may be incurring costs—such as additional labor hours and repair materials—associated with aging equipment. Moreover, the actual need for repairs may be greater than the number of repair requests indicates, according to shipyard officials, because shop level employees are reluctant to submit repair requests when there is little hope of obtaining funding for a repair. Unreliable equipment can also result in increased costs and re-work. For example, after it was discovered in 2015 that the analog controls on a furnace used to heat-treat submarine parts to withstand deep sea pressure were reading inaccurately, Norfolk officials were required to re-inspect 10 years' worth of parts made in that furnace to ensure that they met stringent submarine safety requirements.

Shipyard Capital Facilities and Equipment Are Not Fully Meeting the Navy's Operational Needs and Will Likely Not Support Projected Operational Needs

The shipyards' capital facilities and equipment are not fully meeting the Navy's operational needs, in part due to their condition. Maintenance delays partially attributable to inadequate facilities and equipment at the shipyards have led to thousands of lost operational days for submarines and aircraft carriers over the last 16 fiscal years. In addition, the Navy estimates that its future needs will be increasingly affected by the capacity and capability limitations of the drydocks, even without factoring in the increase in fleet size—18 additional attack submarines and 1 additional aircraft carrier—called for in the Navy's 2016 Force Structure Assessment.²⁹

The Shipyards Are Not Fully Meeting the Navy's Current Operational Needs

We found that the naval shipyards are not fully meeting the Navy's current operational needs, in part due to the condition of their facilities and equipment. The shipyards' ability to meet operational needs is measured by their ability to complete maintenance on time and adhere to the maintenance schedule laid out in the Navy's Optimized Fleet Response Plan. As we previously reported, completing ship and submarine maintenance on time is essential to the Navy's readiness.³⁰ Maintenance availabilities that last longer than planned reduce the number of days ships are available for training or operations.³¹ When ships stay in the shipyards longer than anticipated, it can lead to a negative cyclic effect that affects other vessels in the fleet (see figure 6). Our analysis shows that facilities and equipment in poor condition can contribute to maintenance delays. Navy shipyard officials noted that there are numerous reasons why the maintenance on ships may be delayed—factors such as parts shortages, labor difficulties, changes in the planned

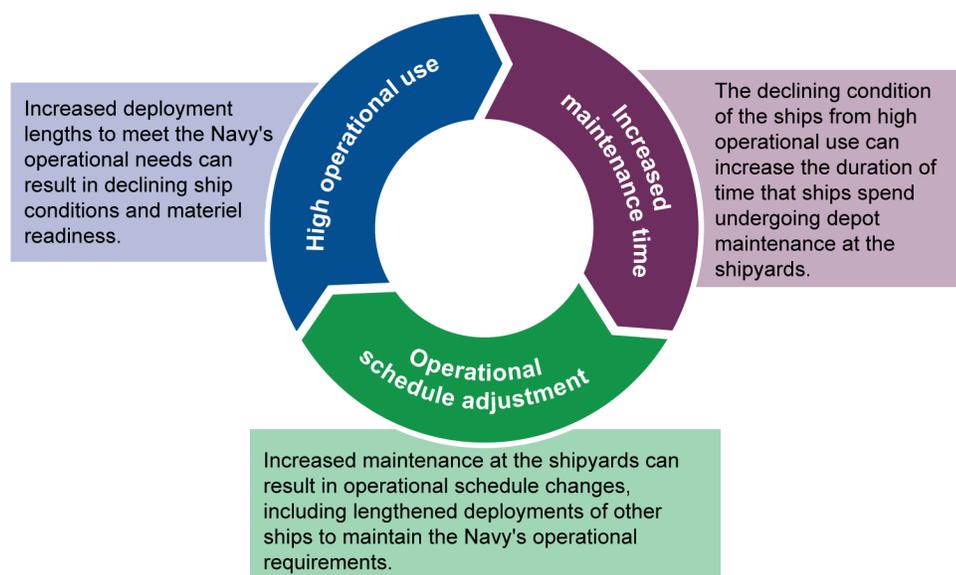
²⁹The Navy's Force Structure assessment is an analysis for which the Navy solicits inputs from U.S. regional combatant commanders regarding the types and amounts of Navy capabilities that they deem necessary to implement the Navy's portion of the national military strategy. The analysis translates these inputs into required numbers of ships, using current and projected Navy ship types. The analysis takes into account Navy capabilities for both warfighting and day-to-day forward-deployed presence.

³⁰GAO, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, [GAO-16-466R](#) (Washington D.C.: May 2, 2016).

³¹Maintenance availabilities are scheduled periods of ship maintenance and modernization. For the purposes of this report, we will refer to maintenance availabilities as "maintenance periods."

maintenance work, and weather—but agreed that the condition of facilities and equipment is one of those reasons.

Figure 6: Cyclic Relationship between Maintenance Delays, Operational Schedules, and Ship Condition



Source: GAO analysis of Navy information. | GAO-17-548

Our analysis of Navy data shows that, in fiscal years 2000 through 2016, the shipyards completed maintenance periods on schedule only 47 percent of the time for aircraft carriers and 24 percent of the time for submarines (see figure 7). These overruns in maintenance periods resulted in at least 1,300 lost operational days—days that a ship is not available for operations—for aircraft carriers and about 12,500 days for submarines during fiscal years 2000 through 2016 (see figure 7). Our analysis of Navy maintenance data shows that delays in maintenance periods that began in fiscal year 2015 caused more than a year's worth of lost operational days for aircraft carriers—the equivalent of losing the use of an aircraft carrier for more than a year.³²

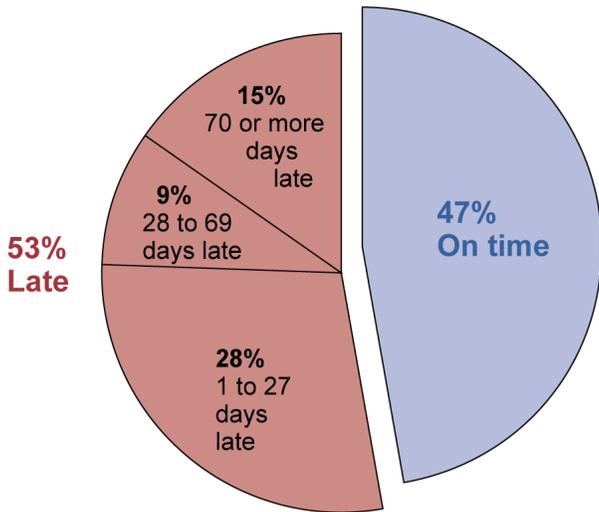
³²This does not necessarily mean that the Navy is missing carrier presence in a given area, because the Navy has other options to mitigate maintenance delays—such as extending another aircraft carrier's deployment.

Figure 7: Operational Days Lost at Naval Shipyards for Aircraft Carriers and Submarines, Fiscal Years 2000 – 2016

Aircraft carriers »

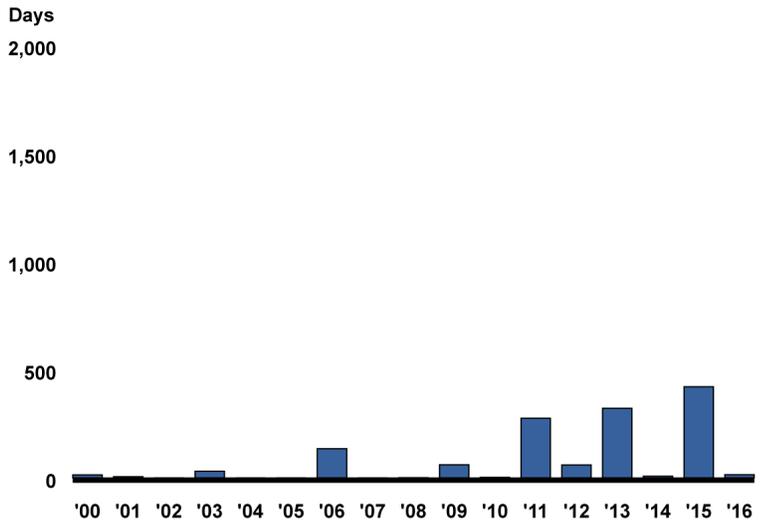
On schedule »

Twenty-five of 53 aircraft carrier maintenance availabilities were completed on schedule in fiscal years 2000 through 2016.



Lost operational days »

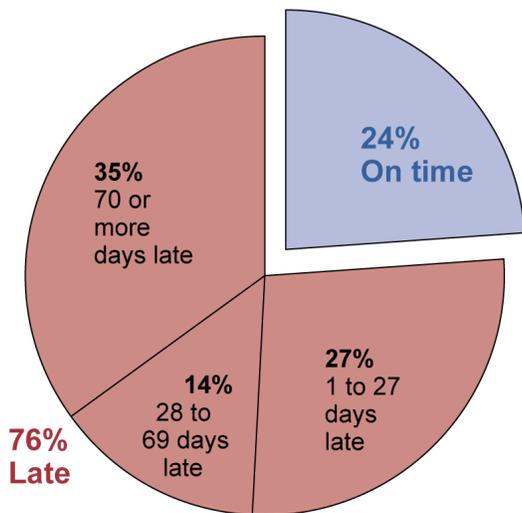
Maintenance availability delays resulted in 1,354 lost operational days in fiscal years 2000 through 2016.



Submarines »

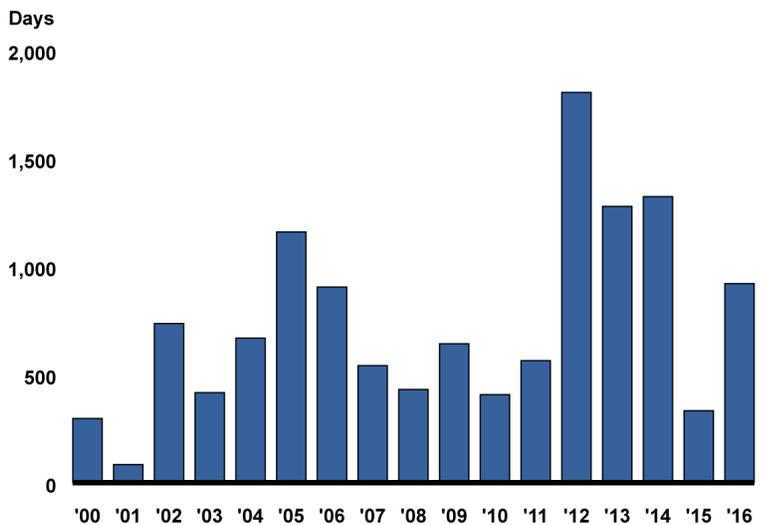
On schedule »

Forty-two of 173 submarine maintenance availabilities were completed on schedule in fiscal years 2000 through 2016.



Lost operational days »

Maintenance availability delays resulted in 12,505 lost operational days in fiscal years 2000 through 2016.



Source: GAO analysis of Navy data. | GAO-17-548

Note: Maintenance timeliness and lost operational days shown for aircraft carriers are for nuclear-powered aircraft carriers only. The percentages of maintenance periods that were not completed on

time do not total 53 percent, because of rounding. Maintenance timeliness and lost operational days for submarines include fleet ballistic missile submarines, attack submarines, and guided-missile submarines. The Navy tracks maintenance periods by the fiscal year in which they begin. Data on the number of lost operational days for fiscal year 2016 for aircraft carriers and fiscal years 2014 through 2016 for submarines are incomplete, because there were still maintenance periods being executed as of March 2017. Total lost operational days are not fully captured until maintenance for a ship or submarine is completed, which means that the data for fiscal years 2014 through 2016 could be understated and could grow.

In addition to hindering efficient ship repair, inadequate facilities cost the Navy in other ways. The Navy reports that it has purchased or rented a large number of temporary facilities at every shipyard to provide them enough space to complete their mission, and the need for such temporary facilities is growing, according to shipyard officials. In its 2013 facilities improvement plan, the Navy identified 650 temporary shipyard structures across the four shipyards, comprising 561,466 square feet.³³ As recently as February of 2017, Puget Sound Naval Shipyard alone reported that it had over 224,000 square feet of relocatable facilities onsite, including approximately 300 temporary trailers. Some “temporary” facilities at the shipyards have been used for decades, and others are double stacked because of a lack of space (see figure 8 for an example).

³³Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013).

Figure 8: Double-Stacked Temporary Office Facilities at Norfolk Naval Shipyard, October 2016



Source: GAO. | GAO-17-548

We observed at Pearl Harbor and Puget Sound that the piers used for repair work can also be crowded, and personnel told us that they leave equipment outside because there is no covered storage space available. For example, shipyard officials at Puget Sound told us they currently have a storage space deficit of approximately 400,000 square feet. They reported that, as a result, they store millions of dollars' worth of equipment and material outside around the shipyard, sometimes uncovered and exposed to the elements. Shipyard officials said this can reduce the lifespan of the equipment, particularly when it is exposed to the saltwater air, which increases the rate of corrosion.

The Navy Estimates That the Shipyards' Drydocks Will Not Support Projected Operational Needs

According to a 2017 draft Navy study, the current capacity and capability of the shipyards' drydocks will not support future operational needs. The Navy projects that the shipyards will be unable to support 73—or about one-third—of 218 maintenance periods planned for the shipyards over the next 23 years, including 5 aircraft carrier and 50 submarine maintenance periods.³⁴ However, this estimate identifies only maintenance periods missed as a result of drydock capacity and capability issues for the planned fleet of 11 carriers and 70 submarines through fiscal year 2040. NAVSEA officials said that other factors that contribute to missed maintenance periods, such as shipyard workload, workforce, or requirements growth, were not accounted for in this estimate.

In its 2017 draft drydock study, the Navy reports that it currently has very little drydock capacity to surge depot-level work or deal with national security contingencies or unanticipated accidents, such as the USS *Greeneville's* (SSN-772) collision with a Japanese fishing ship.³⁵ This is because of the high demand for drydock space, which leaves the Navy with little time between scheduled maintenance periods to do other work. In its 2016 Force Structure Assessment, the Navy released a new force structure goal that called for achieving and maintaining a fleet of 355 ships—up from the previous goal of 308 ships in its 2015 assessment and the current inventory of 276.³⁶ This assessment calls for increasing the number of planned aircraft carriers from 11 to 12 and the number of attack submarines from 48 to 66 (a 38 percent increase). This proposed increase in fleet size will aggravate shortfalls in drydock capacity, since an increase in the number of ships will lead to an increase in the volume of maintenance the shipyards must perform.

In its 2017 draft drydock study, the Navy identified several key drydock shortfalls that hinder the shipyards' ability to support future operational needs, as previously discussed. For example, none of the existing drydocks can support repairs for the new Ford-class aircraft carrier as the drydocks are currently configured. Specifically, Drydock 8 at Norfolk

³⁴The remaining 18 periods that the Navy projects it will be unable to perform are for submarine deactivations.

³⁵In 2001, the Los Angeles class attack submarine USS *Greeneville* collided with a Japanese fishing ship, resulting in damage to the submarine. Pearl Harbor Naval Shipyard conducted the repairs.

³⁶The actual size of the Navy's fleet in recent years has generally been between 270 and 290 ships.

Naval Shipyard and Drydock 6 at Puget Sound Naval Shipyard—the two drydocks currently capable of supporting existing Nimitz-class aircraft carriers—require upgrades in salt water cooling utilities to support maintenance on the new Ford-class aircraft carriers, because the Ford-class carriers are larger and have different equipment. The Navy has plans to begin addressing this issue at Norfolk in fiscal year 2022 and at Puget Sound in fiscal year 2023. Navy officials told us that the Navy has not yet defined its needs for drydocks capable of supporting Ford-class aircraft carriers, but it will need at least one on each coast.

Newer versions of the Virginia-class submarines will limit the number of drydocks able to perform maintenance in the future, thereby reducing the capacity available to the fleet. According to the 2017 draft Navy analysis, 17 of the shipyards' 18 existing drydocks can support maintenance on the current Los Angeles-class attack submarine, and 14 of the 18 can accommodate the current versions of the Virginia-class attack submarine. However, only 11 of the 18 drydocks, in their current state, will be able to accommodate future versions of the Virginia-class submarine with the Virginia Payload Module because of its increased length and loading size.³⁷ This drydock shortfall caused by the addition of this module is exacerbated at Pearl Harbor Naval Shipyard, where there is a drydock that can be divided in two to support simultaneous maintenance of either two Los Angeles-class or two current Virginia-class submarines. Future Virginia-class submarines with the module are so long that they require the full length of the drydock, thereby reducing the space available for maintenance at Pearl Harbor. Shipyard officials noted that this capability is regularly used to respond to immediate, short-term notice events, such as ships in need of emergency repairs.

³⁷The Virginia Payload Module is an additional mid-body section, approximately 84 feet in length, which contains vertical launch tubes that would be used to store and fire additional Tomahawk cruise missiles and other payloads. The Navy plans to include this module in one of the two Virginia-class boats procured in fiscal year 2019 and all of the Virginia-class boats procured in fiscal year 2020 and subsequent years.

The Navy's Capital Investment Approach Is Not Fully Addressing the Shipyards' Challenges

Though the Navy has developed detailed plans for capital investment in facilities and equipment at the shipyards that attempt to prioritize their investment strategies, this approach does not fully address the shipyards' challenges, in part because the plans are missing key elements. Specifically, the Navy's plans are missing capital investment goals that would help guide long-term planning, an accounting of all relevant costs, metrics that would allow an assessment of the effectiveness of capital investment spending, and regular management reviews to assess progress. Our previous work has shown that a comprehensive, results-oriented management approach that includes these elements can help organizations remain operationally effective, efficient, and capable of meeting future requirements.³⁸ DOD has previously used approaches of this kind to address complex, long-standing management challenges, and the Navy's plans have already incorporated some elements of this approach, such as a well-defined mission statement and a detailed discussion of the issues the plans are intended to address. However, without adopting a management approach for its capital investment needs that includes key results-oriented elements, the Navy risks continued deterioration at its shipyards, hindering its ability to efficiently and effectively support Navy readiness over the long term.

The Navy Has Developed Capital Investment Plans for Facilities, Equipment, and Drydocks

Over the last several years, the Navy has developed three capital investment plans intended to help improve the state of the facilities and equipment at the shipyards. In 2013, the Navy released a plan to guide its capital investment for shipyard facilities.³⁹ The plan discusses eliminating the restoration and modernization backlog of facilities projects and centralizing maintenance operations, among other things. Similarly, the Navy issued a plan to guide its investment in capital equipment in 2015.⁴⁰

³⁸See GAO, *Managing For Results: Data-Driven Performance Reviews Show Promise But Agencies Should Explore How to Involve Other Relevant Agencies*, [GAO-13-228](#) (Washington, D.C.: Feb. 27, 2013); *Results-Oriented Management: Strengthening Key Practices at FEMA and Interior Could Promote Greater Use of Performance Information*, [GAO-09-676](#) (Washington, D.C.: Aug. 17, 2009); *Managing For Results: Enhancing Agency Use of Performance Information for Management Decision Making*, [GAO-05-927](#) (Washington, D.C.: Sept. 9, 2005); and *Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers*, [GAO/GGD/AIMD-99-69](#) (Washington, D.C.: Feb. 26, 1999).

³⁹Department of the Navy, *Report to Congress on Investment Plan for the Modernization of Naval Shipyards* (April 2013).

⁴⁰Department of the Navy, *Naval Shipyard Capital Investment Program (CIP) Equipment Investment Requirements* (28 September 2015).

This plan was intended to identify and address all capital equipment needs. Finally, the Navy is currently working on a draft drydock plan that is intended to help prioritize the drydocks projects the Navy feels are necessary to meet upcoming scheduling challenges.⁴¹ That plan is still in draft form, though officials have told us that they expect it to be released this year.

The Navy's Capital Investment Plans Lack Key Elements of a Results-Oriented Approach

Though the Navy's capital investment approach has resulted in the development of three capital investment plans, those plans are missing key elements, including the development of analytically-based goals that would help guide long-term planning, a full identification of the shipyards' resource needs, metrics that would allow the Navy to assess the effectiveness of its capital investment spending in supporting the ability of the shipyards to meet operational needs, regular management reviews of progress, and reporting on progress to key Navy decision makers and Congress. Without incorporating these key results-oriented elements into their approach, the Navy may not be able to address the shipyards' challenges, namely their poor condition, aging equipment, and mounting facility maintenance backlogs.

Capital Investment Plans for the Shipyards Lack Goals That Would Help Guide Long-Term Planning

The Navy's capital investment plans for shipyard facilities and equipment do not include analytically-based results-oriented goals sufficient to support long-term planning. For example, the 2013 facilities improvement plan stated that it was designed to bring the condition of shipyard facilities up to an average condition rating of 75, to match the average Navy condition rating for facilities. However, the Navy chose this goal based on budget expectations rather than an engineering or operational analysis to determine the condition and configuration the shipyards needed to efficiently and effectively address current and future operational needs. Navy officials also told us that there are no Navy or DOD criteria for determining what constitutes effective and efficient shipyard facilities, although such criteria are available for more typical installation facilities, such as barracks or dining facilities.

The Navy's 2015 capital investment plan for equipment identified a desired outcome—to address “all” shipyard equipment requirements—but this desired outcome was not based on an analysis of what the shipyards

⁴¹Naval Sea Systems Command, *Naval Shipyard Drydock Capacity and Survivability Study* (June 14, 2017). This document is still in draft format and has not been released.

needed to support the Navy's operational goals. Navy officials stated that the goal of the plan was to reduce the average age of capital equipment by replacing older equipment with newer, modern versions. Over time, this would reduce the average age of capital equipment to better reflect the average expected service life of about 15 years. However, this goal was not provided in the plan, and there was no mention of alternate methods of assessing equipment condition to determine when it would require replacement. Similar to the 2013 facilities plan, the 2015 equipment plan focuses on financial inputs necessary to achieve improvements, instead of relying on an analytically-based objective, and does not specify when the objective of the plan will be fulfilled.

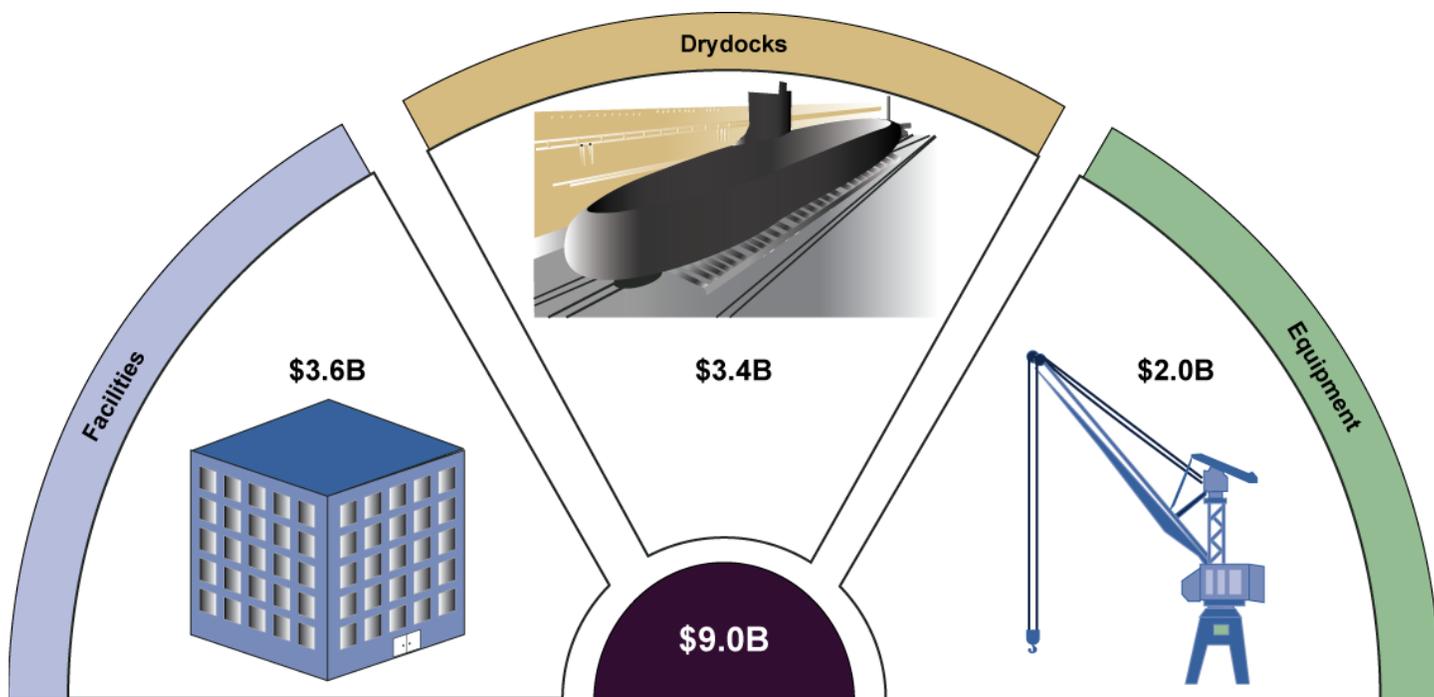
We found no analytical basis to suggest that attaining the goals in the 2013 facilities plan and the 2015 equipment plan would allow the shipyards to efficiently and effectively support current or future operational needs. A results-oriented management approach calls for goals in order for the organization and any additional stakeholders to know what end-state they are trying to reach. These goals also inform other elements, such as the development of metrics to assess progress and the identification of necessary resources. Shipyard officials told us that the plans in place could be characterized as lists of projects desired, rather than effective end-state goals. In a results-oriented management approach, identifying a specific analytically-based goal or end state is essential for accurately determining the costs of achieving that goal, because different end-states could require different shipyard configurations—which in turn would require different facilities and equipment. These differing end states would also likely require different funding levels and timelines. According to the Navy, completing the projects identified to date would allow it to maintain current shipyard capabilities in a steady state. However, completion of these projects would not add to existing shipyard capacity or capability, aside from improvements identified as needed to accommodate new hull types in drydocks. Absent analytically-based goals defining the desired end state, there is no support that the current plan goals will efficiently and effectively meet the Navy's operational needs.

The Navy's Plans Do Not Fully Identify the Shipyards' Capital Investment Needs

The Navy has not fully identified the resources necessary to achieve even the desired results expressed in its 2013 facilities plan and 2015 equipment plan. The Navy estimated funding needs for shipyard facilities, equipment, and drydocks in its 2013 facility plan, its 2015 equipment plan, and its 2017 draft drydock study. Altogether, these plans estimate that the Navy will need a total of at least \$9.0 billion over the next 12 years—fiscal years 2018 through 2029—to improve the average condition of its

shipyard facilities, address drydock needs, and begin to recapitalize its equipment (see figure 9). However, as we have discussed, these estimates are not derived from an analysis of what the shipyards require to efficiently and effectively meet current and future operational needs. We also found that the Navy’s estimates of its shipyard capital investment needs do not account for several potentially costly items, including planning costs and utilities modernization. In addition, the limited resources devoted to planning for shipyard improvements, combined with the generally poor condition and historic status of the shipyards, mean that even the existing estimates may be understated. Identifying the necessary resources is essential in order to acquire and prioritize the use of those resources. Without identifying the full resources required to address the shipyard’s relevant needs and reach analytically-based goals, decision makers will lack the information needed to support deliberations and determine an appropriate level of resources to allocate to the naval shipyards.

Figure 9: Navy-Identified Capital Investment Needs for the Naval Shipyards, Fiscal Years 2018 – 2029, as of Fiscal Year 2017



Source: GAO analysis of Navy data. | GAO-17-548

- The Navy has estimated \$3.6 billion in funding needs, or an average of \$304 million per year, to address shipyard facility needs and bring shipyard facilities up to an average condition rating of 75, which is still

considered “poor.” This amount exceeds the shipyards’ average yearly allotment for facilities of about \$260 million by \$44 million (a 17 percent increase).

- The Navy also estimates that it will need \$2.0 billion over the next 12 years (or an average of \$167 million per year) for capital equipment. This exceeds the average yearly capital equipment funding of about \$50 million by about \$117 million (a 234 percent increase).
- Finally, the Navy has estimated \$3.4 billion in needs over the next 12 years (\$4.1 billion total over 15 fiscal years) to begin mitigating its drydock shortfalls, but the amounts needed per year vary because of the need to accommodate ship maintenance schedules and complete large amounts of work in specific fiscal years.

However, these estimates may under state some potentially costly elements.

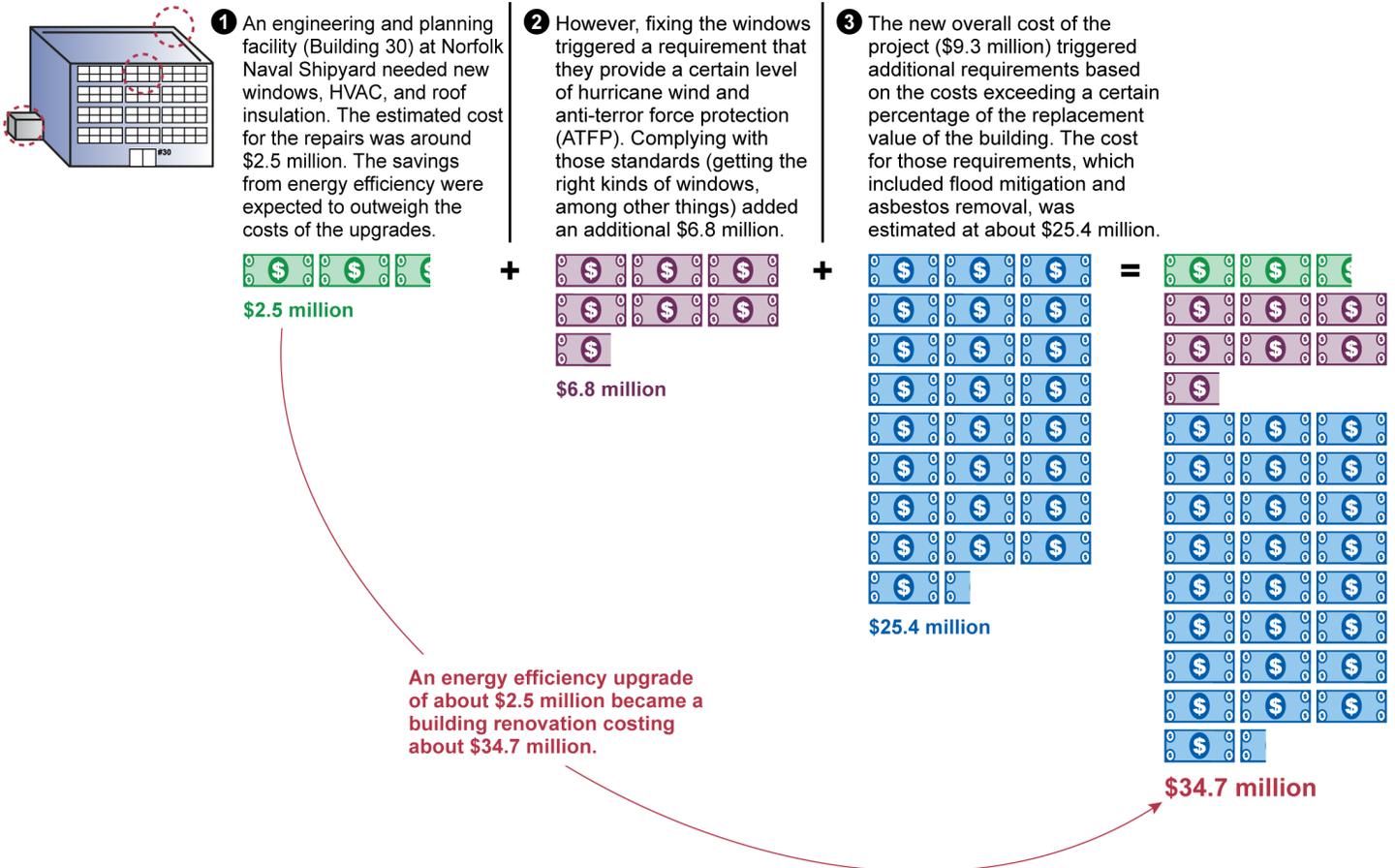
- **Planning costs have not been fully identified:** The Navy has accounted for planning costs for some of its largest projects—those involving its drydocks—but has not calculated similar costs for the remainder of its future capital investment needs. According to Navy officials, in-depth planning and engineering are required to repair and modernize industrial facilities while allowing ongoing shipyard operations to proceed, ensuring that adequate preparations are made to support facility improvements and that the necessary utilities are in place, addressing potential historic or regulatory considerations, and ensuring that the location can support the project. The Navy projects that the planning costs associated with its drydock improvements will be at least \$284 million over the 12 years—roughly 8 percent of the total project costs—although shipyard officials have noted that planning costs can easily exceed 10 percent of a project’s total cost. This suggests that the planning costs for the \$3.6 billion in facilities projects identified by the Navy could increase the total cost of these projects by several hundred million dollars.
- **Utilities modernization costs have not been not fully identified:** NAVFAC has identified about \$190 million in additional utilities projects through fiscal year 2023 that are not already in one of the other Navy plans, but it has not identified the improvements needed beyond fiscal year 2023. The Navy’s 2013 plan did not include the cost of modernizing utilities, though it noted that efforts were under way to develop cost estimates for their recapitalization. The Navy previously reported in its 2013 facilities plan that shipyards experienced unscheduled utility outages that can disrupt maintenance

schedules and lead to increased fuel and labor costs. Navy officials acknowledge the ongoing need to modernize utilities and other wired systems at the shipyards. For example, the fire alarm systems at the shipyards continue to rely on the same bare-wire telegraph technology that was used in the 1800's and early 1900's, which is easily damaged and regularly elicits false alarms. However, according to officials, they have not determined the full amount of investment that would be required to modernize utilities at the shipyards to provide a stable electrical supply at the proper voltages with fewer unplanned outages.

- **Regulatory compliance costs may be under stated:** Shipyard facilities are subject to a variety of regulatory requirements, stemming from both DOD and statutory sources. Like other military installations, shipyards must comply with anti-terrorism, force protection, seismic, and building code requirements. However, given the limited resources devoted to planning, current plans to improve shipyard facilities, equipment, and drydocks do not address the effect of some of these statutory and regulatory requirements. Anti-terror and force protection, seismic, building codes, and other requirements to improve the health and safety of shipyard personnel can increase the amount of funding required to complete capital investment projects, particularly when compliance efforts overlap. For example, DOD regulations require that when the cost of a project reaches 30 percent of the replacement value of the facility, seismic assessments must be conducted, and if a project's cost exceeds 50 percent of the facility's replacement value, anti-terror and force protection measures must be included in the project.⁴² According to shipyard officials, the DOD requirements that must be met after a project exceeds the 30 percent threshold are sometimes costly enough to make it exceed the 50 percent threshold, and the results of overlapping requirements can be difficult to predict. This can result in the cost of relatively simple projects increasing significantly, as indicated by the example in figure 10, illustrating an actual project at Norfolk Naval Shipyard developed between fiscal years 2010 and 2015.

⁴²Unified Facilities Criteria (UFC) 3-310-04, *Seismic Design for Buildings* (June 1, 2013) and UFC 4-010-01, *DOD Minimum Antiterrorism Standards for Buildings* (Feb. 9, 2012).

Figure 10: Reported Effect of Statutory Requirements on Upgrades to a 120-Year-Old Facility at Norfolk Naval Shipyard



Source: GAO analysis of Navy documents. | GAO-17-548

Note: These figures are based on the Navy's estimated project costs. The Navy has since awarded a contract for this renovation for \$21.6 million. However, the renovation has not yet been completed and the contract does not cover all the costs identified in the project estimate. As a result, we do not yet know the final cost of the Building 30 renovation, though Navy officials have stated that they believe it will be around \$7 to \$8 million lower than their initial estimate.

Building 30 at Norfolk Naval Shipyard is used for engineering, and is over 120 years old. The costs to bring it up to modern building code were significant. This example may not be representative of the potential growth of project costs, but the age of shipyard facilities, the extent of historic designations, and the Navy's acknowledged history of under investment at the shipyards highlight the potential for other shipyard facilities to encounter similar issues. This suggests that the Navy's estimated restoration and modernization backlog of \$4.86 billion may actually be under stated.

-
- **Historic preservation costs may be under stated:** Our analysis and Navy documents show that dealing with historic facilities also adds cost and complexity to planning for their restoration. The preservation, restoration, or demolition of historic buildings requires additional time and cost to plan, gain necessary approvals, and execute. In its 2013 facility plan, the Navy reported that approximately 70 percent of the shipyard infrastructure was designated as historic; all four shipyards have historic facilities, some because of the age of the facilities and some because of events that took place there. For example, the attack on Pearl Harbor during World War II has resulted in the designation of approximately 3 million square feet of its facilities as historic; this means that the footprint of the historic part of the shipyard exceeds that of its non-historic facilities. Shipyard officials told us that there are several facilities that might be used to more effectively support shipyard operations but that either they cannot be altered because they have been designated as historic or that alterations would require lengthy negotiations over the facilities' historic designation. For example, officials at Pearl Harbor Naval Shipyard discussed a number of modernization efforts that might be undertaken to improve Navy capabilities in the Pacific but that cannot be completed because the facilities have been designated as historic.

The Navy's Approach Lacks Metrics to Gauge the Effectiveness of Its Capital Investment Plans

Automated Gasket Cutting Improves Shipyard Operations

Machinery in use aboard nuclear aircraft carriers and submarines often requires specific gasket and seal capabilities that can withstand high pressure and extreme temperatures. In the past, depot maintainers at Portsmouth and Norfolk shipyards cut these gaskets by hand, using a method similar to that being used by a sailor aboard the USS Carl Vinson, pictured below.



Source: Defense Video Imagery Distribution System. | GAO-17-548

Portsmouth officials stated that the practice of cutting submarine gaskets by hand often required multiple attempts in order to achieve an acceptable result. This resulted in wasted material, increased labor costs, and reduced morale. Officials at Portsmouth Naval Shipyard and Norfolk Naval Shipyard told us that specialized equipment designed for automated gasket cutting was readily available, and that recent acquisitions of this equipment have improved safety, shipyard efficiency, and reduced delays to repairs from re-work.

Source: GAO review of Navy documentation, direct observation of a live demonstration, and discussion with Navy officials. | GAO-17-548

The Navy lacks metrics that would help determine the effectiveness of its capital investment plans to help guide long-term planning. With a comprehensive, results-oriented management approach, relevant metrics allow an organization to assess whether it is making progress toward meeting its goals. Our previous work has shown that a suite of metrics can help organizations to assess complicated issues, where one metric may be insufficient or may not capture all relevant information.⁴³ Our work shows that the Navy tracks the performance of its shipyards in completing ship maintenance on budget and on time but not how facilities and equipment are supporting the shipyards' performance. Specifically, we found that the shipyards' primary performance metrics are tied to ship maintenance—for example, how quickly a ship is repaired, how much overtime is used, and cost and schedule overruns—and do not provide a sufficient basis for measuring the effect of capital investments on shipyard performance. The Navy also collects data on its facilities, including the aforementioned configuration and condition assessments, along with data on repairs, utilities outages, and maintenance response times.⁴⁴ However, this information is not used to assess the efficacy of the capital investment program. For example, according to NAVSEA officials, the Navy does not monitor when facility or equipment issues contribute to schedule delays or increase maintenance costs (such as when equipment failures prevent work) or the costs associated with deferring investment (e.g., foregone efficiencies, costs to repair obsolete equipment, costs of workarounds, or temporary facility costs). However, we found that deferring investment can lead to decreased efficiency in other areas. For example, our analysis of equipment repair data found that equipment repair requests have been increasing and that this increase could reflect the effect of deferred maintenance. Alternatively, investments in modern equipment or facilities can increase efficiency, reduce costs, and improve morale (see sidebar). Until the Navy establishes appropriate metrics and other measures of progress for the shipyards, it will not know if it is reaching its previously developed goals.

⁴³GAO, *Defense Inventory: Actions Needed to Improve the Defense Logistics Agency's Inventory Management*, GAO-14-495. (Washington, D.C.: June 2014).

⁴⁴For example, regular tracking of utility outages allowed the Navy to identify roughly \$6 million in additional infrastructure projects.

The Navy Does Not Conduct Regular Management Reviews of its Plans or Report to Key Decision Makers and Congress on Capital Investment at the Shipyards

We found that the Navy does not conduct regular management reviews of activities and metrics that would measure progress toward meeting the goals of its various capital investment plans and encourage accountability and coordination among the stakeholders involved in planning for these capital investments. The Navy conducts annual assessments of capital investment projects as part of its normal budgeting and prioritization processes. However, officials state that they do not regularly review the implementation status of the 2013 facilities plan or the 2015 equipment plan. NAVSEA is responsible for identifying and prioritizing capital investment projects and overseeing the implementation of the 2013 facilities plan. However, according to NAVSEA officials, there is no formal requirement or system to actively manage the implementation of the 2013 facilities plan or to coordinate with shipyard stakeholders such as CNIC or NAVFAC.

Officials state that they coordinate with stakeholders as necessary when projects associated with the capital investment plans experience problems but do not report to higher-level Navy decision makers and Congress on the progress in achieving specific objectives in capital investment plans, such as reducing the facilities restoration and modernization backlog, improving the condition and configuration of the shipyards, recapitalizing capital equipment, and reducing the effect that unimproved facilities and equipment have on maintenance delays. Progress is assessed annually during the programming and budgeting process, with emphasis on ensuring that the Navy meets its minimum capital investment requirements (the “6 Percent Rule”) under 10 U.S.C. § 2476. According to officials, lack of coordination between the shipyards and local NAVFAC personnel also can delay equipment upgrades if the utilities or facilities infrastructure fails to support the equipment (e.g., if equipment requires reinforced flooring or increased electrical supply). Some of the equipment being installed at shipyards can require extensive modifications to the facilities. For example, we observed a foundation being prepared for a new piece of equipment at Norfolk Naval Shipyard, shown in figure 11.

Figure 11: Foundation Being Strengthened to Accept New Capital Equipment at Norfolk Naval Shipyard



Source: GAO. | GAO-17-548

We have found that, with a results-oriented management approach, regular management review allows an organization to assess progress by reviewing metrics, ensure that all stakeholders are working together effectively, and respond to implementation challenges.⁴⁵ Given the need to coordinate stakeholders such as NAVSEA, CNIC, NAVFAC, Navy Regional Installation Commanders, utility providers, State Historic Preservation Offices, regulatory entities, and Navy leadership, regular management reviews of activities and metrics could help the Navy to measure progress toward attaining its capital investment goals for the shipyards.

In addition, the Navy does not regularly provide information to its key DOD decision makers or to Congress on the progress it is making to reduce its facilities restoration and modernization backlog, improve the condition and configuration of the shipyards, recapitalize its capital equipment or reduce the effect that the condition of facilities and

⁴⁵GAO, *Military Transformation: Clear Leadership, Accountability, and Management Tools Are Needed to Enhance DOD's Efforts to Transform Military Capabilities*, [GAO-05-70](#) (Washington, D.C.: Dec. 17, 2004).

equipment have on maintenance delays. It is also not providing information on the challenges that prevent the shipyards from making such progress. *Standards for Internal Control in the Federal Government* notes that management should communicate quality information to external parties to help the agency achieve its goals and address risk.⁴⁶ As a result, key decision makers and Congress lack the information they would need to assess the effectiveness of the Navy's capital investment program at the shipyards. Regular management review and reporting on progress to decision makers is critical to ensure that all stakeholders are represented and held accountable for results, and that opportunities for adjustment are identified and used.

Recent Actions May Begin to Add Results-Oriented Elements to Managing Shipyard Capital Investment

Over the last few months, Navy officials and Congress have both taken steps to help address some of the problems outlined in this report. For example, Navy officials have said that they are beginning a more comprehensive review of the shipyards that will involve, among other things, improving cooperation among various stakeholders, developing capital investment metrics that are tied to shipyard performance, and changing the expectations around capital investment. However, this process is still in a very early stage and its timeframes are not yet developed. Until the Navy develops an approach that addresses these missing elements, the result will be a continuation of the same processes that have led the shipyards to their current state, which have already proved to be inadequate.

To help address the naval shipyards' capital investment challenges, House Report 115-200 accompanying a bill for the Fiscal Year 2018 National Defense Authorization Act directed the Secretary of the Navy to provide a report to the congressional defense committees, by March 1, 2018, on a comprehensive plan to address shortfalls in the public shipyard enterprise. Specifically, the House Report directs the Navy to, among other things, identify current infrastructure deficiencies at U.S. naval shipyards and prepare a detailed master plan for each shipyard that includes a list of specific infrastructure projects, scope of work, cost estimates, and schedule associated with the current and 30-year force structure projections. The Secretary of the Navy is also directed to identify the additional funding and any legislative authority needed to achieve an

⁴⁶GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#). (Washington, D.C.: September 2014).

end state, as quickly as practicable, of the elimination of all ship maintenance backlogs and a return to predictable, sustainable, and affordable ship maintenance availabilities, including for the anticipated growth in Navy force structure.

Conclusions

The shipyards are critical to maintaining the Navy's readiness, but they are struggling to meet the Navy's current needs with inadequate facilities, aging equipment, poorly configured drydocks, a growing restoration and modernization backlog, and an incomplete management approach for addressing these issues. The Navy recognizes these challenges, but to date the plans it has developed to address them have failed to gain ground against the poor condition of the facilities or the backlog of restoration and modernization needs. Continuing the current approach to capital investment seems unlikely to address the Navy's struggles with lost operational days and drydock availability. Without the key characteristics of a results-oriented management approach for guiding, measuring, and tracking the progress of its capital investment program, the Navy cannot be certain that its capital investment efforts are providing the facilities and equipment needed to support the nuclear depot repair mission or that it is providing Congress with adequate information on which to base decisions about appropriations. The lack of a results-oriented management approach could lead to ineffective investment, resulting in missed opportunities for improvement that could affect shipyard cost and schedule performance. Further, if the shipyards are unable to maintain their facilities and equipment, they risk not being able to support Navy readiness over the long term. Because the shipyards are essential to maintaining readiness for the fleet of U.S. aircraft carriers and submarines and providing emergent repairs on an as-needed basis, ineffective management of capital investment in the shipyards can put Navy readiness at risk.

On July 6, 2017, the House Armed Services Committee released report 115-200 accompanying a bill for the National Defense Authorization Act for Fiscal Year 2018. The committee's report directs the Secretary of the Navy to report to congressional defense committees on a comprehensive plan to address shortfalls in the public shipyards. Identified elements to be included in the plan include aspects of a results-oriented management approach—namely a comprehensive plan to address shortfalls in the public shipyard enterprise, end-state goals for the shipyards, and the funding needed to achieve this end-state—that we've identified as missing from the shipyard development plans we analyzed. We believe, however, that the Navy's implementation of the House direction could be

further strengthened. The Navy's prior planning efforts have not fully established metrics for assessing progress, held regular management reviews with all relevant stakeholders to oversee the plans' implementation and coordinate efforts, or reported on progress to key decision makers and Congress to inform resource decisions and provide accountability. Without fully incorporating these key elements, the Navy will not be positioned to guide the continued improvement of the condition and ability of the shipyards to meet the operational needs of the Navy.

Recommendations for Executive Action

We are making the following three recommendations to the Navy. The Secretary of the Navy should do the following:

Develop a comprehensive plan for shipyard capital investment that establishes

- the desired goal for the shipyards' condition and capabilities;
- an estimate of the full costs to implement the plan, addressing all relevant requirements, external risk factors, and associated planning costs; and
- metrics for assessing progress toward meeting the goal that include measuring the effectiveness of capital investments.

(Recommendation 1)

Conduct regular management reviews that include all relevant stakeholders to oversee implementation of the plan, review metrics, assess the progress made toward the goal, and make adjustments, as necessary, to ensure that the goal is attained. (Recommendation 2)

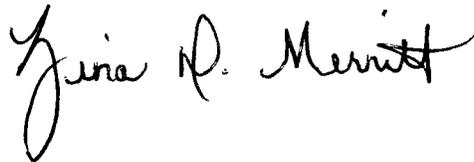
Provide regular reporting to key decision makers and Congress on the progress the shipyards are making to meet the goal of the comprehensive plan, along with any challenges that hinder that progress, such as cost. This may include reporting on progress to reduce their facilities restoration and modernization backlogs, improve the condition and configuration of the shipyards, and recapitalize capital equipment. (Recommendation 3)

Agency Comments

We provided a draft of this report to DOD for review and comment. In written comments on behalf of DOD provided by the Navy (reproduced in appendix III), DOD concurred with our recommendations and noted planned actions to address each recommendation. The Navy also provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, and the Secretary of the Navy. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have questions about this report, please contact me at merrittz@gao.gov or (202) 512-5257. GAO staff who made key contributions to this report are listed in appendix IV.

A handwritten signature in black ink that reads "Zina D. Merritt". The signature is written in a cursive style with a large initial "Z".

Zina D. Merritt
Director,
Defense Capabilities and Management

List of Committees

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

Appendix I: Observations on the Navy's Public Shipyards after the Transition to Direct Funding

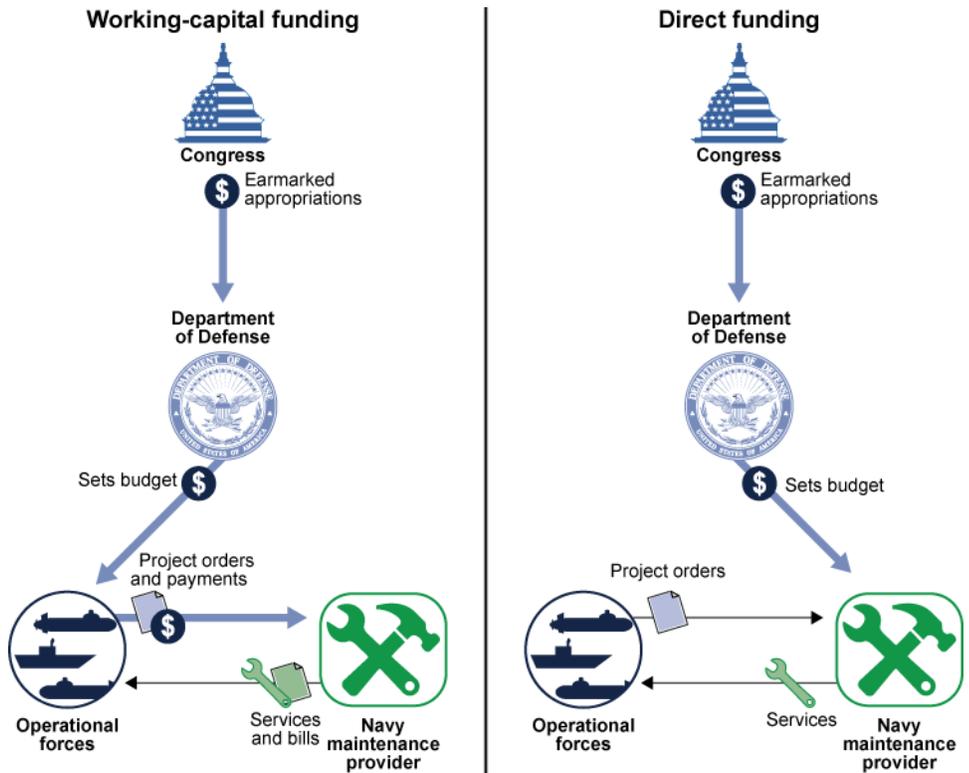
History of the Transition from the Working Capital Fund to Direct Funding

Prior to 1998, the Navy used two different funding mechanisms to fund its maintenance activities, depending on the level of maintenance a ship was receiving.¹ The shipyards, which provided depot-level maintenance, were managed through a working capital fund. The working capital fund relied on payments from Navy forces—such as a ship—for services at a shipyard. This funding approach was intended to (1) generate sufficient resources to cover the full costs of the shipyards' operations and (2) operate on a break-even basis over time—that is, neither make a gain nor incur a loss. The Department of Defense (DOD) directed Navy funds to the Navy forces seeking the repairs, and those forces acted as customers and paid for the maintenance they received from the shipyards (see figure 12). The Navy's intermediate maintenance facilities, which provided intermediate-level maintenance, were funded via direct funding.² Under the direct funding mechanism, the Navy allotted a portion of the money appropriated to it by Congress to fund the shipyards (see figure 12).

¹Ship depot-level maintenance involves materiel maintenance or repair requiring the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies and testing and reclamation of equipment, as necessary. Ship intermediate-level maintenance includes calibrating, repairing, or replacing damaged parts; manufacturing critical unavailable parts; and providing technical assistance.

²For purposes of this report, we use "direct funding" to refer to amounts allotted by the Navy in support of shipyard activities out of its annual appropriations. Congress generally provides direction to the Navy in conference reports or explanatory statements accompanying annual appropriations acts on amounts to be allotted for specific shipyard activities.

Figure 12: Funding Flows in Working Capital Structure and under Direct Funding



Source: GAO. | GAO-17-548

In 1997, the Navy began to integrate its intermediate maintenance facilities with its shipyards in an attempt to improve workforce flexibility and reduce maintenance infrastructure. To achieve this, the Navy decided to standardize the funding mechanism. The Navy moved the shipyards to a direct funding mechanism, in part because the shipyard's largest customer—the Pacific Fleet—was already funded in that manner and Navy officials believed that adopting a direct funding approach for shipyard maintenance would be simpler than changing the Fleet's funding mechanism. Pearl Harbor Naval Shipyard shifted from working capital funding to direct funding on October 1, 1998 as a pilot program. The Navy conducted this pilot for two years and concluded that shipyard metrics generally either improved or stayed the same over that time.³ As a result,

³The exceptions to this were two metrics—the number of completed and uncompleted maintenance actions—that were deemed by the Navy to be inconclusive.

Puget Sound Naval Shipyard followed and changed funding mechanisms on October 1, 2003. Congress briefly paused the funding transition process for the East Coast shipyards in order to have the Navy provide a report on the effectiveness of the transition at Puget Sound.⁴ After the Navy submitted its report, the transition continued, and Portsmouth Naval Shipyard and Norfolk Naval Shipyard transitioned to the direct funding mechanism on October 1, 2006, the earliest transition date that Congress had allowed.

In previous reports, both we and the Congressional Budget Office noted that there were potential advantages and disadvantages to both funding mechanisms.⁵ However, we did not suggest that the Navy should prefer one method over the other; rather, we recommended that the Navy take steps to ensure financial transparency at the shipyards after the transition to direct funding.

Shipyards after the Transition to Direct Funding

Since the two remaining shipyards transitioned to a direct funding mechanism at the beginning of fiscal year 2007, capital investment at the shipyards has been higher than the 6 percent minimum mandated by Congress and has increased at about the same pace as overall shipyard funding.⁶ Shipyard officials have not identified any persistent problems as a result of the funding transition and were generally unable to identify any potential benefits of returning to a working capital fund mechanism.

⁴National Defense Authorization Act for Fiscal Year 2006, Pub. L. No. 109-163, § 322 (2006).

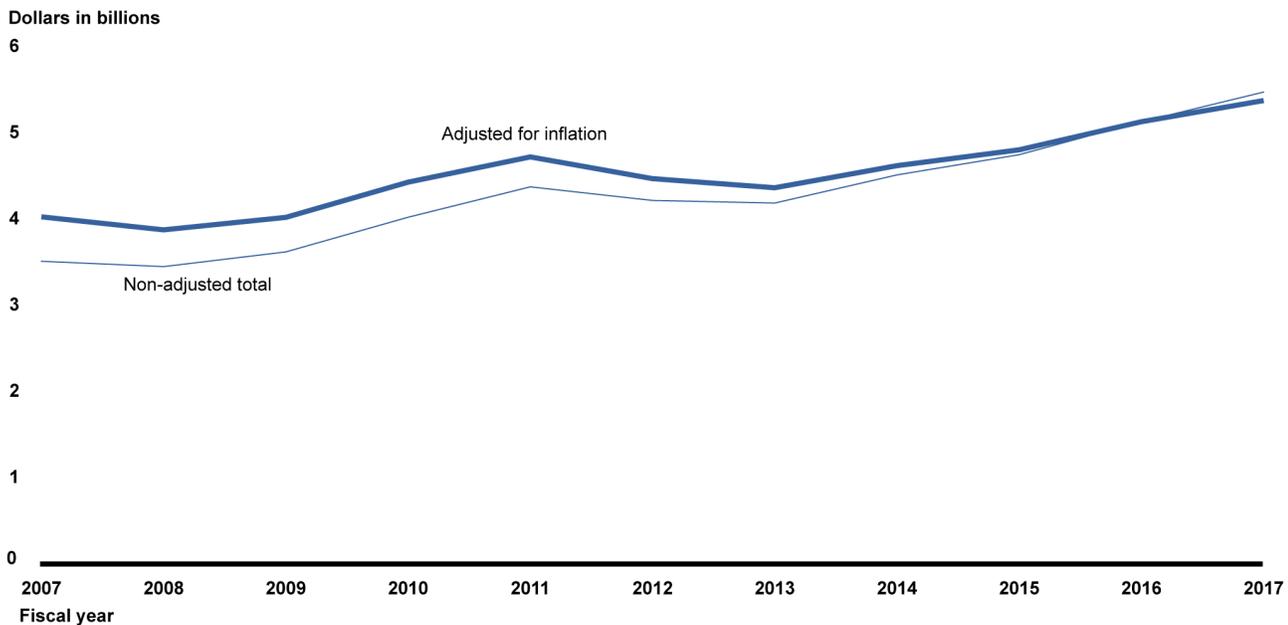
⁵See CBO, *Comparing Working-Capital Funding and Mission Funding for Navy Shipyards* (Washington, D.C.: April, 2007) and GAO, *Depot Maintenance: Improvements Needed to Achieve Benefits from Consolidations and Funding Changes at Naval Shipyards*, [GAO-06-989](#) (Washington, D.C.: September 14, 2006).

⁶Section 2476 of title 10, U.S. Code requires the Secretary of the Navy to invest in the capital budgets of the Navy depots a total amount equal to not less than 6 percent of the average total combined maintenance, repair, and overhaul workload funded at all the Navy depots for the preceding three fiscal years. This is also known as the "6 Percent Rule." Due to data limitations, we were not able to do the type of analyses that would allow us to determine what role, if any, the transition in funding played in explaining the post-transition levels of capital investment.

Shipyard Spending and Capital Investment since Fiscal Year 2007

Between fiscal year 2007—the first year that all shipyards were completely supported by direct funding—and fiscal year 2017, total shipyard spending has increased by about 34 percent, in fiscal year 2016 constant dollars (see figure 13).⁷

Figure 13: Total Shipyard Spending, Nominal and Inflation-Adjusted, FY 2007 – FY 2017



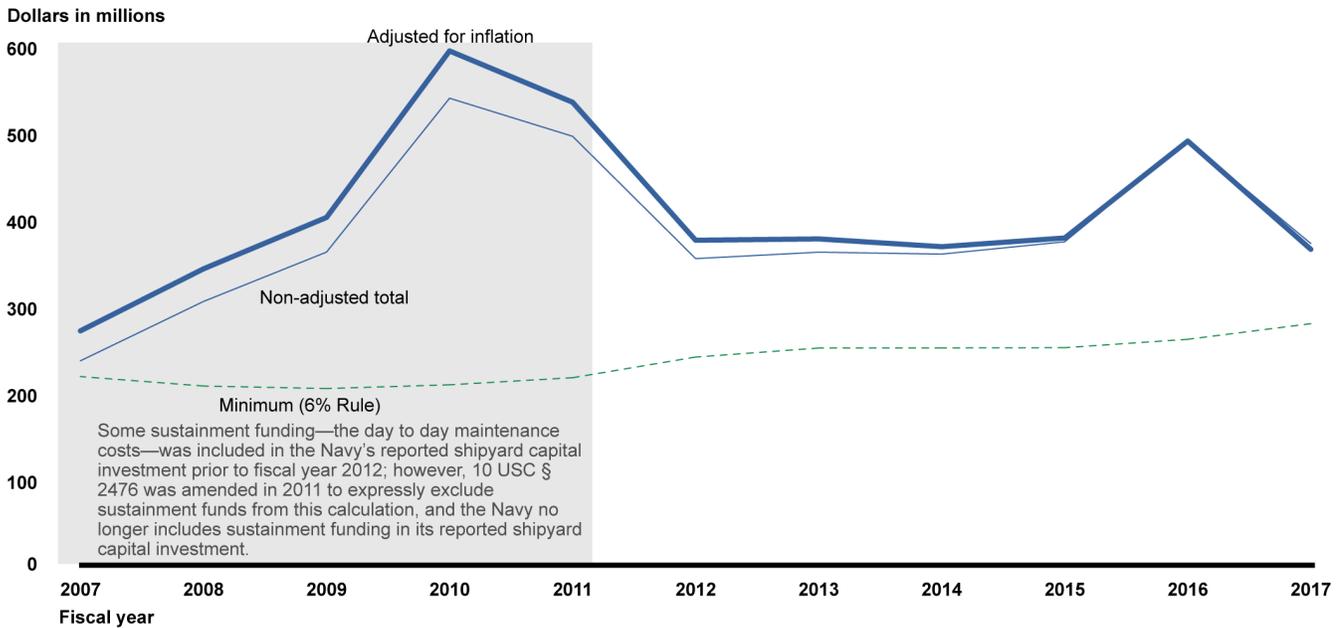
Source: GAO analysis of Navy budget documents. | GAO-17-548

Note: Inflation adjustment was accomplished with the fiscal year gross domestic product index, using fiscal year 2016 as the index year. The fiscal year 2017 amount is projected.

Over that same time period, capital investment at the shipyards, in fiscal year 2016 constant dollars, has increased at about the same rate—35 percent—and has remained over the 6 percent minimum mandated by Congress (see figure 14).

⁷We were not able to obtain comparable data prior to fiscal year 2007 that would allow for a direct comparison of metrics. As a result, we cannot state whether capital investment or shipyard performance have improved or worsened after the transition to direct funding.

Figure 14: Total Shipyard Capital Investment, Nominal and Inflation-Adjusted, with 6 Percent Investment Minimum, FY 2007 – FY 2017



Source: GAO analysis of Navy budget documents from fiscal years 2009 through 2018. | GAO-17-548

Note: Inflation adjustment was accomplished with the fiscal year gross domestic product index, using fiscal year 2016 as the index year. Fiscal year 2007 and 2008 figures are estimates, because no actual figures were reported for those years, and the fiscal year 2017 amount is projected, given that the fiscal year is not complete. The 6 Percent Rule in statute requires that the services spend an amount on capital investment equal to the sum total of the average total combined maintenance, repair, and overhaul workload funded at all the Navy depots, which include the shipyards, Navy Fleet Readiness Centers, and Marine Corps Production Plants. The 6 percent line denoted here was identified by the Navy as the shipyard's portion of the service's 6 percent requirement, although the shipyards could spend more or less than this amount without necessarily meeting or failing to meet the requirements of the statute. Both of the peaks in the graph can be accounted for by individual projects—a Norfolk pier improvement project accounts for most of the peak in fiscal years 2010 and 2011, and a Norfolk waterfront utility project accounts for about half of the peak in fiscal year 2016.

Statements of Shipyard Officials on the Transition to Direct Funding

Navy officials at all four shipyards stated that they had not identified any significant concerns about the change from working capital to direct funding. For example, although the CBO report suggested that financial accountability might decrease under a direct funding mechanism, officials stated that working within the annual allotment of appropriated funds—as opposed to a constantly replenishing working capital fund—has forced shipyard officials to pay greater attention to costs than they had previously. In addition, officials at all four shipyards stated that after the initial transition was complete, the change in funding mechanisms had little effect on either the quality or the cost of the work being performed.

Officials also noted that, under each funding mechanism, there are reasons that capital investment may remain relatively low. Shipyard capital investment (not including military construction) under the working capital mechanism was previously re-captured by the shipyards in the form of increased labor costs. They stated that, as a result, there was an incentive to keep capital investment low, so that the fleet would not defer maintenance and repair work in response to higher daily rates for labor. Under the direct funding mechanism, shipyard capital investment must compete with other projects Navy wide, which may also result in restraining investment.

Appendix II: Condition and Performance of the Individual Naval Shipyards

There are four Navy-operated shipyards: Norfolk Naval Shipyard, Portsmouth Naval Shipyard, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility. This appendix provides detailed information about each of these shipyards' missions, issues, maintenance timeliness, facilities condition, capital investment, and facilities restoration and modernization backlog.



Year Established

1767

History/Mission

Norfolk Naval Shipyard is the Navy's oldest shipyard, originally established in 1767 under British rule. It is a full-service shipyard that is capable of repairing and modernizing the entire range of Navy ships, including aircraft carriers, submarines, surface combatants, and amphibious ships. It is the only East Coast naval shipyard capable of dry-docking nuclear-powered aircraft carriers.

Unique Issues

Norfolk Naval Shipyard is vulnerable to flooding events. According to the Navy, the shipyard's drydocks were not designed to accommodate the threats posed by the increased intensity and frequency of severe weather and sea-level rise. More specifically, four of Norfolk Naval Shipyard's five drydocks are exposed to flooding, including from extreme high tides and hurricanes. The shipyard is subjected on average to one major flood event annually. Further, the ground elevation at three of these drydocks is at the 10-year flood level and is subject to frequent tidal-related storm damage.

Performance

In fiscal years 2000 through 2016, 27 of 49 maintenance availabilities were delayed, resulting in 2,945 lost operational days for nuclear-powered aircraft carriers and submarines.

Appendix II

Norfolk Naval Shipyard

Portsmouth, Virginia

Figure 15: Norfolk Naval Shipyard



Drydocks: 5



Workforce (fiscal year 2016):
10,543 civilians



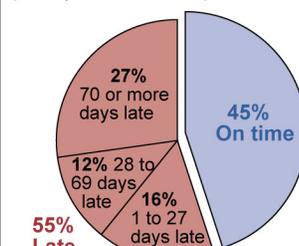
Total Shipyard Funding
(fiscal year 2016): \$1.50 billion



Facilities Restoration and Modernization Backlog
(fiscal year 2016): \$1.34 billion



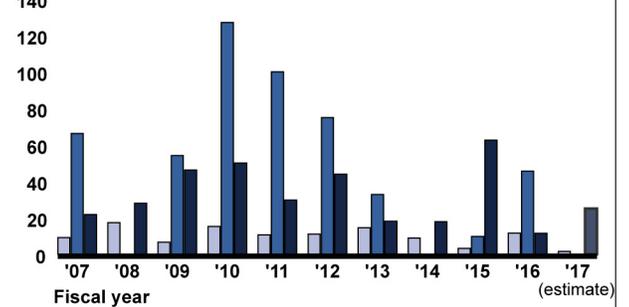
Maintenance Availability Timeliness
(fiscal years 2000-2016)



Shipyard Facility and Equipment Investments

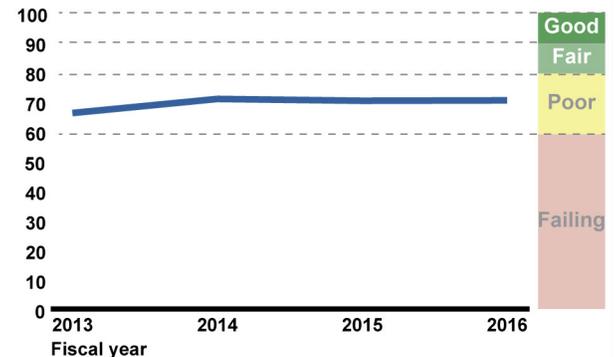
Dollars in millions

Legend:
■ Capital equipment
■ Military construction
■ Facilities sustaintment, restoration, and modernization



Shipyard Facility Condition

Score



Source: GAO analysis of Navy data and budget documents; Navy (photo). | GAO-17-548



Year Established

1800

History/Mission

Portsmouth Naval Shipyard launched its first ship in 1814. More than a hundred years later, during World War I, it took on an important role in constructing submarines, in addition to maintaining and repairing surface ships. The Navy continued to build submarines at Portsmouth until 1969, when the last submarine built in a public shipyard was launched. Currently, Portsmouth Naval Shipyard exclusively repairs nuclear-powered submarines.

Unique Issues

According to the Navy, one of Portsmouth Naval Shipyard's three drydocks will lose the capability to support submarine workload by 2021 unless additional capital investments are made. Drydock 1's shallow depth, coupled with the tidal range, currently restrict it to repairing Los Angeles-class submarines with the use of additional buoyancy assistance equipment. The buoyancy assistance equipment used by Portsmouth is more than 40 years old and will reach the end of its service life in 2021.

Performance

In fiscal years 2000 through 2016, 29 of 44 maintenance availabilities were delayed, resulting in 2,066 lost operational days for nuclear-powered submarines.

Portsmouth Naval Shipyard

Kittery, Maine

Figure 16: Portsmouth Naval Shipyard



Drydocks: 3



Workforce (fiscal year 2016):
5,508 civilians



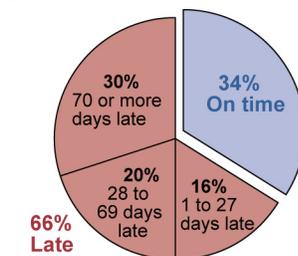
Total Shipyard Funding
(fiscal year 2016): **\$824.9 million**



Facilities Restoration and Modernization Backlog
(fiscal year 2016): **\$802.5 million**



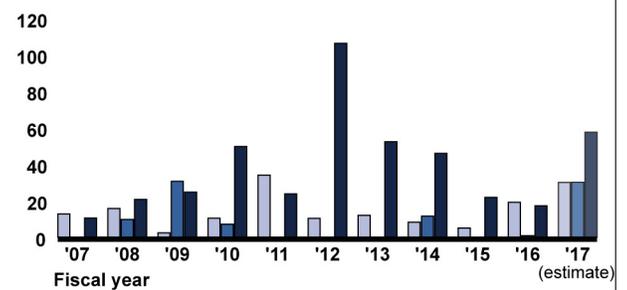
Maintenance Availability Timeliness
(fiscal years 2000-2016)



Shipyard Facility and Equipment Investments

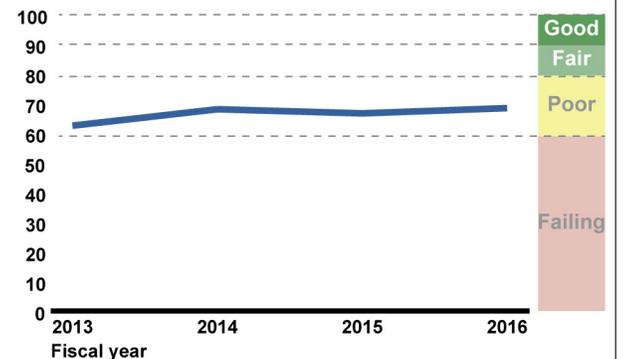
Dollars in millions

Legend:
 Capital equipment (light blue)
 Military construction (medium blue)
 Facilities sustaintment, restoration, and modernization (dark blue)



Shipyard Facility Condition

Score



Source: GAO analysis of Navy data and budget documents; Navy (photo). | GAO-17-548



Puget Sound Naval Shipyard and Intermediate Maintenance Facility

Bremerton, Washington

Year Established

1901

History/Mission

Puget Sound Naval Shipyard, located in Bremerton, Washington, was originally established in 1891 as Naval Station Puget Sound; it was designated a naval shipyard in 1901. It was originally designed to construct ships, including submarine chasers, submarines, and ammunition ships. Currently, it is the largest shipyard on the West Coast, and while it is equipped and staffed to work on all classes of Navy vessels, it primarily conducts maintenance on nuclear-powered aircraft carriers and submarines. It has the only drydock on the west coast that is capable of servicing an aircraft carrier. Additionally, it is the Navy's only site for reactor compartment disposal and ship recycling for nuclear-powered ships.

Unique Issues

Puget Sound lies on an active fault line, and the Navy estimates that it will need significant infrastructure improvements in order to make it more likely to survive a severe earthquake.

Performance

In fiscal years 2000 through 2016, 54 of 76 maintenance availabilities were delayed, resulting in 4,720 lost operational days for nuclear-powered aircraft carriers and submarines.

Figure 17: Puget Sound Naval Shipyard and Intermediate Maintenance Facility



Drydocks: 6



Workforce (fiscal year 2016):
13,425 civilians



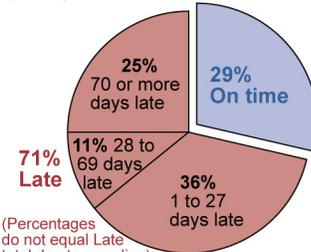
Total Shipyard Funding
(fiscal year 2016): **\$1.95 billion**



Facilities Restoration and Modernization Backlog
(fiscal year 2016): **\$1.42 billion**

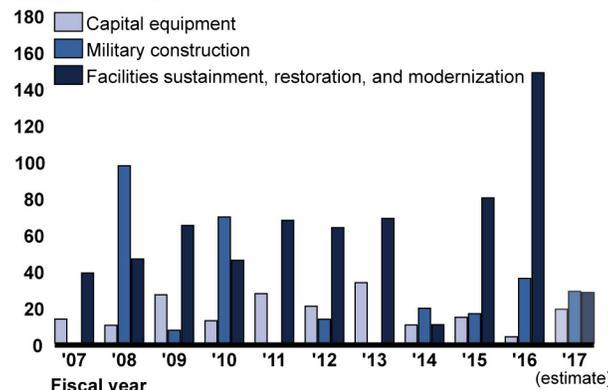


Maintenance Availability Timeliness
(fiscal years 2000-2016)

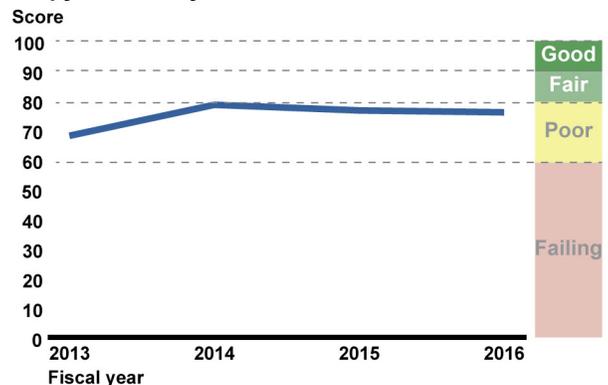


Shipyard Facility and Equipment Investments

Dollars in millions



Shipyard Facility Condition



Source: GAO analysis of Navy data and budget documents; Navy (photo). | GAO-17-548



Year Established

1908

History/Mission

Pearl Harbor Naval Shipyard was originally established as a mid-Pacific coaling and repair station for the U.S. Navy, but its mission has evolved in the years since then. Today, it is the Navy's largest ship repair facility located between the West Coast and the Far East. It focuses primarily on the maintenance and repair of submarines and surface combatants.

Unique Issues

Pearl Harbor Naval Shipyard faces historic preservation challenges that have complicated its infrastructure planning and capital investment. Eighty percent of its nearly 4 million square feet of facilities is designated as historic. According to the Navy, preservation, restoration, or demolition of historic facilities can require additional time and cost for both planning and execution. Shipyard officials told us that, because of these historic preservation challenges, they have forgone facility projects that would have improved efficiency.

Performance

In fiscal years 2000 through 2016, 49 of 57 maintenance availabilities were delayed, resulting in 4,128 lost operational days for nuclear-powered submarines.

Appendix II

Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility

Pearl Harbor, Hawaii

Figure 18: Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility



Drydocks: 4



Workforce (fiscal year 2016):
5,050 civilians



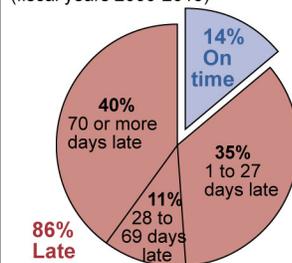
Total Shipyard Funding
(fiscal year 2016): **\$838 million**



Facilities Restoration and Modernization Backlog
(fiscal year 2016): **\$1.31 billion**



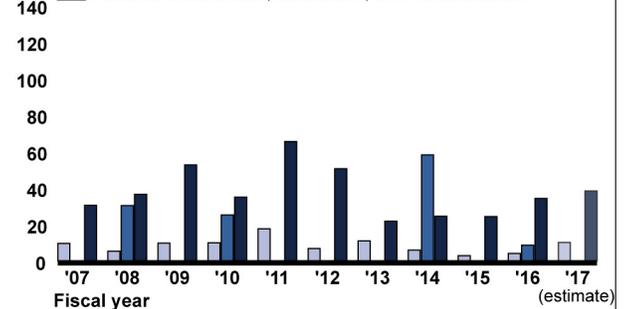
Maintenance Availability Timeliness
(fiscal years 2000-2016)



Shipyard Facility and Equipment Investments

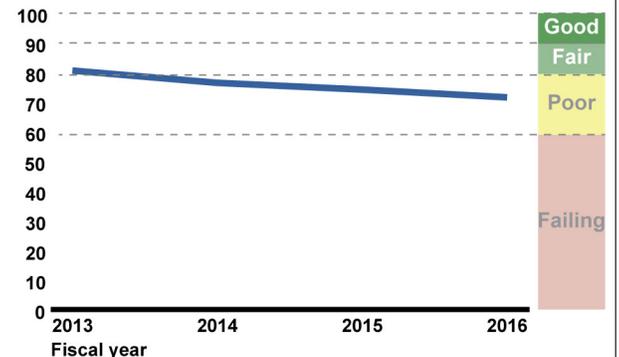
Dollars in millions

Legend:
■ Capital equipment
■ Military construction
■ Facilities sustaintment, restoration, and modernization



Shipyard Facility Condition

Score



Source: GAO analysis of Navy data and budget documents; Navy (photo). | GAO-17-548

Appendix III: Comments from the Department of Defense



DEPARTMENT OF THE NAVY
THE ASSISTANT SECRETARY OF THE NAVY
(ENERGY, INSTALLATIONS AND ENVIRONMENT)
1000 NAVY PENTAGON
WASHINGTON DC 20350-1000

September 1, 2017

Ms. Zina Merritt
Director, Defense Capabilities Management
U.S. Government Accountability Office
441 G Street N.W.
Washington, DC 20548

Dear Ms. Merritt,

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report, GAO-17-548, "NAVAL SHIPYARDS: ACTION NEEDED TO IMPROVE POOR CONDITIONS THAT AFFECT OPERATIONS", dated September 2017 (GAO Code 101028). The DoD acknowledges receipt of the draft report.

The Department of the Navy is responding on behalf of the DoD. As more fully explained in the enclosure, the DoD concurs with the recommendations in the report.

The DoD appreciates the opportunity to comment on the draft report. For further questions concerning this report, please contact the primary action officer, CAPT Thomas Moskal, Facility Investments Branch Head, at thomas.moskal@navy.mil or 703-695-9141.

Sincerely,


STEVEN R. ISELIN

Enclosure

GAO DRAFT REPORT DATED JULY 27, 2017
GAO-17-548 (GAO CODE 101028)

“NAVAL SHIPYARDS: ACTION NEEDED TO IMPROVE POOR CONDITIONS
THAT AFFECT OPERATIONS”

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

The Department concurs with the overall findings of the report, but we also note that the Navy is well aware of the need to improve the conditions at our shipyards and supplemented the 2013 facilities plan with a proactive analysis of dry dock utilization, vulnerabilities, and projected future capacity to support new platforms. As shown in Figure 2 of the report the Navy has also consistently exceeded the 6% minimum capital investment despite ongoing fiscal constraints.

RECOMMENDATION 1: The GAO recommends that the Secretary of the Navy to develop a comprehensive plan for shipyard capital investment that establishes:

- the desired goal for the shipyards' condition and capabilities;
- an estimate of the full costs to implement the plan, addressing all relevant requirements, external risk factors, and associated planning costs; and
- metrics for assessing progress toward meeting the goal that include measuring the effectiveness of capital investments.

DoD RESPONSE: Concur. The Navy will develop a comprehensive plan for shipyard capital investment that establishes shipyard goals, estimate of the full costs and metrics for assessing progress. For reference purposes this recommendation will be identified as GAO-17-548-01.

RECOMMENDATION 2: The GAO recommends that the Secretary of the Navy conduct regular management reviews that include all relevant stakeholders to oversee implementation of the plan, review metrics, assess the progress made toward the goal, and make adjustments as necessary to ensure that the goal is attained.

DoD RESPONSE: Concur. The Navy will conduct regular management reviews that include all relevant stakeholders to oversee implementation of the plan, review metrics, assess the progress made toward the goal, and make adjustments as necessary. For reference purposes this recommendation will be identified as GAO-17-548-02.

RECOMMENDATION 3: The GAO recommends that the Secretary of the Navy provide regular reporting to key decision makers and Congress on the progress the shipyards are making to meet the goal of the comprehensive plan, along with any challenges that hinder that progress, such as cost. This may include reporting on progress to reduce their facilities restoration and modernization backlogs, improve the condition and configuration of the shipyards, and recapitalize capital equipment.

**Appendix III: Comments from the Department
of the Navy**

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DoD RESPONSE: Concur. The Navy will provide regular reporting to key decision makers and Congress on the progress the shipyards are making to meet the goal of the comprehensive plan. For reference purposes this recommendation will be identified as GAO-17-548-03.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Zina D. Merritt, (202) 512-5257 or merrittz@gao.gov

Staff Acknowledgments

In addition to the individual named above, key contributors to this report were Suzanne Wren (Assistant Director); Pat Donahue; Steve Donahue; Jaci Evans; James Lackey; Joanne Landesman; Amie Lesser; Felicia Lopez; Marc Molino; Leah Nash; Carol Petersen; Cody Raysinger; and John E. "Jet" Trubey.

Related GAO Products

Agency Performance Plans: Examples of Practices That Can Improve Usefulness to Decisionmakers, [GAO/GGD/AIMD-99-69](#) (Washington, D.C.: Feb. 26, 1999).

Managing For Results: Enhancing Agency Use of Performance Information for Management Decision Making, [GAO-05-927](#) (Washington, D.C.: Sept. 9, 2005).

Depot Maintenance: Improvements Needed to Achieve Benefits from Consolidations and Funding Changes at Naval Shipyards, [GAO-06-989](#) (Washington, D.C.: September 14, 2006).

Results-Oriented Management: Strengthening Key Practices at FEMA and Interior Could Promote Greater Use of Performance Information, [GAO-09-676](#) (Washington, D.C.: Aug. 17, 2009).

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Managing For Results: Data-Driven Performance Reviews Show Promise But Agencies Should Explore How to Involve Other Relevant Agencies, [GAO-13-228](#) (Washington, D.C.: Feb. 27, 2013).

Standards for Internal Control in the Federal Government, [GAO-14-704G](#). (Washington, D.C.: September 2014).

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Military Readiness: DOD's Readiness Rebuilding Efforts May Be at Risk without a Comprehensive Plan, [GAO-16-841](#) (Washington, D.C.: September 7, 2016).

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