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September 2024

# NAVY READINESS

## Actions Needed to Improve Support for Sailor-Led Maintenance

# GAO Highlights

Highlights of [GAO-24-106525](#), a report to the Committee on Armed Services, House of Representatives

## Why GAO Did This Study

The Navy must have combat-ready ships to keep the U.S. safe and ensure the seas are open to trade. Sailors perform basic maintenance and repairs that are essential for preserving a ship's operational capabilities.

House Report 117-397, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2023, includes a provision for GAO to assess the extent to which the Navy supported sailor-led maintenance and repairs aboard ships. This report evaluates, among other things, the extent to which the Navy provides (1) personnel and training, and (2) management processes and systems for sailor-led maintenance.

GAO analyzed guidance, policy, and data; conducted a survey of executive officers aboard 232 ships of the active battle fleet (91 percent response) and interviewed relevant officials; and met with more than 140 leadership personnel and 200 sailors on 25 ships of the active battle fleet.

## What GAO Recommends

GAO is making seven recommendations to the Navy to, among other things, improve the quality of information on the number of ship's crew available for duty; ensure that maintenance guidelines reflect personnel numbers and skill levels specific to ships or ship classes; and better communicate with stakeholders on logistics IT improvement efforts. The Navy concurred with each recommendation.

View [GAO-24-106525](#). For more information, contact Diana Maurer at (202) 512-9627 or [MaurerD@gao.gov](mailto:MaurerD@gao.gov).

September 2024

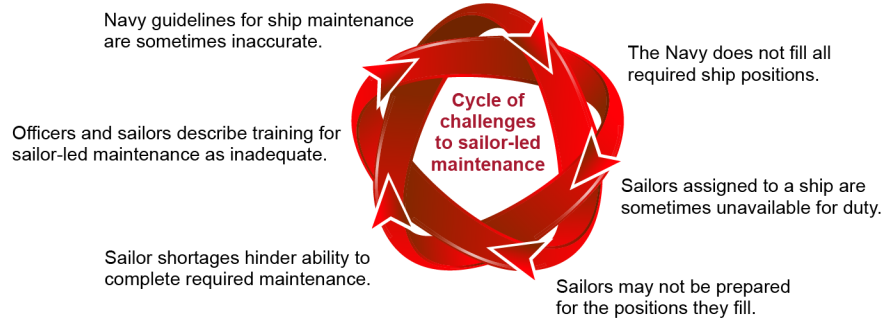
## NAVY READINESS:

### Actions Needed to Improve Support for Sailor-Led Maintenance

## What GAO Found

The Navy faces several interrelated personnel and training challenges that inhibit sailors' ability to complete required ship maintenance. GAO found that the Navy does not fill all required ship positions, and that sailors assigned to a ship are sometimes unavailable for duty (for example, temporarily assigned to another ship) or may have inadequate training or preparation for their positions.

#### Interrelated Personnel and Training Challenges Inhibit Sailor-Led Maintenance



Source: GAO analysis of Navy information (text); ryno/stock.adobe.com (cycle). | GAO-24-106525

Sailor shortages hinder sailors' ability to complete required maintenance, according to survey respondents, sailors from GAO's 25 ship visits, and GAO's review of Navy data. For example, 63 percent of executive officers completing GAO's survey said it was moderately to extremely difficult to complete repairs while underway with the number of sailors assigned to their ships. In addition, the Navy does not track and report data on the number of sailors assigned to a ship, but not available for duty, according to officials. The Navy could improve the quality of information reported to Congress by updating policy to report data on whether sailors assigned to a ship were available and reported for duty.

Navy executive officers and sailors told GAO there were widespread concerns about sailor training. When relying on available formal (classroom) training, 64 percent of executive officers responding to GAO's survey said it is moderately to extremely difficult to conduct sailor-led maintenance, and 75 percent found it moderately to extremely difficult for sailors to complete repairs. In addition, the Navy's guidelines for performing ship maintenance are sometimes inaccurate with respect to the time and personnel needed and are not written appropriately for sailors' maintenance skills and supervisor's experience levels. Ensuring the Navy's guidelines better reflect the actual number and skill level of maintenance personnel will enhance sailors' ability to maintain ships.

The Navy is working to replace old and fragmented logistics information technology (IT) systems it currently uses to manage sailor-led maintenance. But it did not effectively share its vision for logistics IT improvements to meet stakeholder needs. Establishing a process to inform stakeholders—such as shipboard personnel—will improve the Navy's ability to implement a new system that better harmonizes maintenance information and meets user needs.

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## Abbreviations

AMD	Activity Manpower Document
CNO	Chief of Naval Operations
COSAL	Coordinated Shipboard Allowance List
DOD	Department of Defense
IT	information technology
NAVMAC	Navy Manpower Analysis Center
NAVSUP	Naval Supply Systems Command
NETC	Naval Education and Training Command
N-MRO	Naval Maintenance, Repair, and Overhaul
OMMS-NG	Organizational Maintenance Management System-Next Generation
SMD	Ship Manpower Document

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September 9, 2024

The Honorable Mike Rogers  
Chairman  
The Honorable Adam Smith  
Ranking Member  
Committee on Armed Services  
House of Representatives

**Admiral Lisa Franchetti, Chief of Naval Operations**

“To sustain America’s advantage at sea in the face of increasing global competition, the Navy needs a lethal force that balances current readiness and future modernization to deter in peace, and if necessary, decisively win in conflict.”

Source: Advance Policy Questions for Admiral Lisa M. Franchetti, U.S. Navy, Nominee for Appointment to be Chief of Naval Operations, Hearing Before the Senate Armed Services Committee, 118th Cong. (Sept. 14, 2023). | GAO-24-106525

The Navy plays a critical role in safeguarding the U.S. and keeping the seas open to trade and world commerce. Having well maintained, combat-ready Navy ships is essential to preserving the peace, according to Navy officials. Over the last 30 years, the Navy changed ship maintenance policy and practices in successive attempts to reduce costs by closing Naval ship repair facilities, decreasing the number of personnel assigned to ships, reducing the amount of practical training provided to ship’s crews, and increasing the amount of ship repairs provided by contractors as opposed to sailors, according to Navy officials.

Sailor-led maintenance and repairs is the first defense against allowing small defects to become major material problems, which could affect ship operations and mission capability.<sup>1</sup> Sailor-led maintenance refers to maintenance actions within the capability and resources provided to the organization that routinely oversees equipment operation, such as a ship’s crew. We previously reported that

- ship crew size was insufficient, and personnel from other commands were supplementing crews to conduct maintenance;<sup>2</sup>
- reductions in crew sizes were negatively affecting the ships’ material condition and could ultimately lead to an increase in ship mishaps;
- decreased personnel costs were offset by increased maintenance costs;

<sup>1</sup>Chief of Naval Operations Instruction (OPNAVINST) 4700.7M, *Maintenance Policy for Navy Ships* (May 8, 2019). For the purposes of this report, we are referring to the Navy’s organizational-level maintenance as sailor-led maintenance.

<sup>2</sup>The Navy’s term for assigning personnel, to include personnel on ships, is “manning.” In this report, we use the terms “crew,” “crewing,” or “filling positions” instead of “manning,” unless the latter is used in an official name of an organization, title of a report or document, or in a direct quotation.

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- the Navy routinely assigns fewer personnel to its ships than its workload studies determine are needed to safely operate them and has understated personnel shortfalls;<sup>3</sup>
  - poor maintenance training leads to an extensive reliance on on-the-job training aboard ships; and
  - shortages in the tools, parts, and materials needed adversely affect sailor-led maintenance performance.<sup>4</sup>

In 2022, the House Armed Services Committee noted that sailor-led maintenance is a key driver of fleet readiness. While recognizing the variety of Navy efforts underway to improve complex maintenance while in port, the committee maintained that it is unclear whether challenges at the organizational maintenance level are being adequately addressed.<sup>5</sup> House Report No. 117-397, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2023, includes a provision for us to assess the extent to which the Navy has supported sailor-led maintenance and repairs aboard ships.<sup>6</sup> This report evaluates the extent to which the Navy provides (1) personnel and training, (2) parts and materials, and (3) management processes and systems for completing sailor-led maintenance.

For each of our objectives, we conducted a survey of executive officers aboard 232 surface ships, aircraft carriers, and submarines in the Navy's

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<sup>3</sup>See GAO, *Navy Readiness: Additional Efforts Are Needed to Manage Fatigue, Reduce Personnel Shortfalls, and Implement Training*, [GAO-21-366](#) (Washington, D.C.: May 27, 2021); GAO, *Navy Force Structure: Actions Needed to Ensure Proper Size and Composition of Ship Crews*, [GAO-17-413](#) (Washington, D.C.: May 18, 2017); GAO, *Military Readiness: Progress and Challenges in Implementing the Navy's Optimized Fleet Response Plan*, [GAO-16-466R](#) (Washington, D.C.: May 2, 2016).

<sup>4</sup>See Related GAO Products at the end of this report.

<sup>5</sup>H.R. Rep. No. 117-397, pt. 1, at 87 (2022).

<sup>6</sup>H.R. Rep. No. 117-397.

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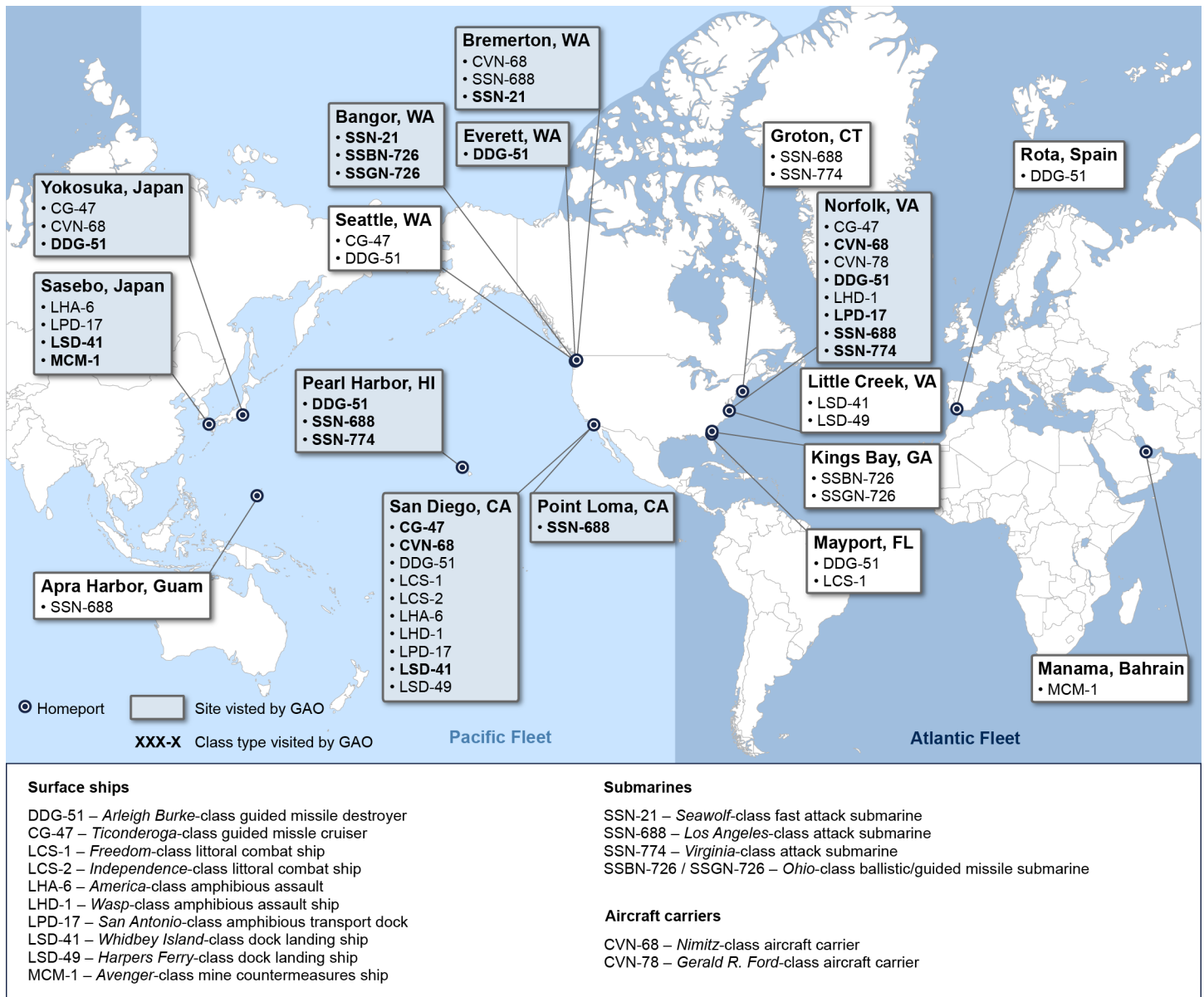
active battle fleet that were in the scope of our review.<sup>7</sup> We obtained responses from the executive officers from 91 percent of these ships, aircraft carriers, and submarines and analyzed the results. For a complete version of the survey, see appendix I. In addition, we interviewed more than 140 ship leadership personnel, conducted discussion groups with more than 200 sailors, and observed maintenance aboard 25 ships (11 percent of the ships within the scope of our review) in the United States and overseas. Figure 1 shows surface ships, aircraft carriers, and submarines and their respective homeports, and marks the ship classes that we visited.

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<sup>7</sup>According to the Naval Vessel Registry, there were 242 active (in commission) ships in the battle fleet as of February 9, 2023, including support and auxiliary vessels. Battle force ships are commissioned United States Ship (USS) warships built or armed for naval combat and capable of contributing to combat operations, or other naval ships including United States Naval Ships that contribute directly to Navy warfighting or support missions. There were 242 active battle force ships (in commission), including support and auxiliary vessels as of February 9, 2023, according to the Naval Vessel Registry. The Navy's battle force ship count includes surface combatant ships, amphibious warfare ships, aircraft carriers, submarines, and combat logistics ships, among others. We considered mine countermeasure ships to be within the scope of our review due to their designation as combatants and their forward-deployed status. We also included command ships, which are designed to operate in the open ocean to provide direct support to combatant forces or operations within our scope. Other Navy vessels, such as patrol coastal combatant craft, are not part of the Navy's battle force inventory, though they are designated as combatant crafts. Secretary of the Navy Instruction (SECNAVINST) 5030.8D, *General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures* (June 28, 2022). We did not include auxiliary ships such as hospital ships in our survey since they are not designated as combatants. We also did not survey Navy support ships such as expeditionary sea bases and submarine tenders, or Military Sealift Command replenishing ships. As a result, the population of ships in our scope that we surveyed is 232.



**Figure 1: Homeport Locations and Classes of Navy Surface Ships, Aircraft Carriers, and Submarines Visited During GAO's Review**



Source: GAO analysis of Department of Defense data; Map Resources (map). | GAO-24-106525

Note: The Navy assigns its ships to a homeport; this is where the ship is based, its crew and their families reside, and from where it is primarily managed and maintained. Bolded ship classes indicate those that we visited.

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We also reviewed relevant statutes, Department of Defense (DOD) and Navy guidance; interviewed officials responsible for aspects of sailor-led maintenance; and reviewed documents, data, systems, and resources used to manage and complete sailor-led maintenance and repairs.

For our first objective, we analyzed data on the number of personnel required from the Naval Vessel Registry and Ship Manpower Documents, and additional personnel data for the 25 ships we visited. These data included assigned personnel, rating, department, division, and quality of alignment. We also collected information on the number of personnel that “mustered” or reported for work on a given day for selected ships. For quality of alignment, we collected data on a non-representative sample of ships, and so the results of our analysis are not generalizable. However, our results are consistent with the survey responses that we obtained from executive officers representing 91 percent of the ships that we surveyed. In addition, we reviewed Naval Education and Training Command (NETC) information on initial skills training curriculums and reviewed recent data on fleet material readiness (maintenance accomplishment).<sup>8</sup>

For our second objective, we reviewed shipboard metrics for the 232 ships that were part of the scope of our review. We compared Navy Coordinated Shipboard Allowance List (COSAL) gross effectiveness rates with Navy data for ships that were active during at least part of the period from 2017 through 2022.<sup>9</sup> In order to compare allowance list updates with the timing of depot maintenance periods, we requested and received data from the office of the Deputy Chief of Naval Operations for Fleet Readiness and Logistics on allowance list updates for 115 of the ships in the active battle fleet and that we included in our survey. In addition, we reviewed Navy documents and data related to the effectiveness of efforts to determine what quantities of spare parts are needed aboard ships.

For our third objective, we reviewed documentation from the Navy Board of Inspection and Survey, along with cost, schedule, and budget information related to the Navy’s Naval Maintenance, Repair and

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<sup>8</sup>U.S. Fleet Forces Command, which provided the data, is a shore command whose missions are to: train, certify; and provide combat-ready forces; plan and execute assigned service functions; provide operational planning and coordination support; and plan and execute joint missions.

<sup>9</sup>The COSAL establishes spare and repair parts; maintenance assistance modules; operating space items; test equipment; and special tools required to operate and maintain systems and equipment installed in U.S. Navy ships.

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Overhaul (N-MRO) program provided by the Program Executive Office for Manpower, Logistics, and Business Solutions. We also attended two Navy-wide conferences held in Norfolk, Virginia. We attended a Navy-wide conference on maintenance and material management (3M) in April 2023. We also attended a conference on the status of Logistics IT updates that include N-MRO along with aspects of Ready Relevant Learning and Supply Chain Management in November 2023. In addition, we reviewed documents and information related to logistics and supply chain modernization efforts.

We assessed the reliability of computer-generated data by (1) reviewing existing information about the data and the systems that produced them, (2) sending data reliability questionnaires to system owners and reviewing their responses; and (3) interviewing knowledgeable agency officials in the United States Fleet Forces Command and United States Pacific Fleet Command about the quality control procedures used to ensure the accuracy and completeness of the data. We also compared the data with other documentation relevant to each objective. We found that most of the data we examined were sufficiently reliable to establish Navy-wide trends. We note below where any discrepancies in the data may impact the Navy's ability to manage sailor-led maintenance and repairs. We discuss our scope and methodology in more detail in appendix II.

We conducted this performance audit from January 2023 to September 2024 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.

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## Background

### Types of Navy Ships

Battle force ships are capable of contributing to combat operations or directly to Navy warfighting or support missions.<sup>10</sup> The Navy's inventory consists of surface ships, aircraft carriers, and submarines. Unless otherwise noted, we collectively refer to amphibious warfare ships,

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<sup>10</sup>Battle force ships are commissioned United States Ship (USS) warships built or armed for naval combat and capable of contributing to combat operations, or other naval ships including United States Naval Ships that contribute directly to Navy warfighting or support missions.

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surface ships, aircraft carriers, and submarines as ships and submarines in this report.

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## Sailors Participate in All Levels of Ship Maintenance

The Navy uses sailors to conduct or support every type of maintenance necessary to sustain a Navy ship such as organizational-level maintenance and repairs, intermediate maintenance, and depot maintenance.<sup>11</sup>

**Organizational-level maintenance and repairs.** Organizational-level, or sailor-led, maintenance and repairs are usually performed during operations or at operational bases. These activities include inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. Sailor-led maintenance and repair responsibilities include preventive actions; corrective actions; and additional maintenance activities. For example:

- **Preventive actions** are cleaning and routine planned maintenance, such as inspections, operability tests and diagnostics, lubrication, and calibration.
- **Corrective actions** are repairs to hull, mechanical, and electrical components; electronic troubleshooting down to the lowest replaceable unit level; miniature and micro-miniature electronic repair; component change-outs, and in some cases, complete disassembly; and repair aboard ship to restore operational capabilities.
- **Additional maintenance activities** are assisting intermediate- or depot-level maintenance activities; verifying the maintenance accomplished by those activities; providing quality assurance of the work done; and ensuring documentation of all deferred and completed maintenance is complete regardless of who did the work.

**Intermediate maintenance.** The Navy uses continuous maintenance availability periods to conduct maintenance that can be done in short periods, typically scheduled to last 2 to 6 weeks. Intermediate maintenance period schedules can vary, and commanders can adjust, postpone, or cancel them based on operational demands. Intermediate

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<sup>11</sup>We generally refer to organizational-level maintenance as sailor-led maintenance, and to ships' crews as sailors unless there is a specific need to differentiate them from officers. In this case, we will refer to ships' crews as enlisted sailors. Unless otherwise stated, Navy guidance for maintenance and material management applies to all U.S. Navy ships, fleet commanders, type commanders, systems commands, and all afloat and ashore maintenance organizations. For more information, see OPNAVINST 4700.7M.

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maintenance periods can also be used to accomplish repairs necessary for a ship to deploy or continue its deployment.<sup>12</sup>

**Depot-level maintenance.** The Navy uses Chief of Naval Operations (CNO) maintenance periods to accomplish industrial, depot-level maintenance, and modernization—work that cannot be conducted by ship’s crews or goes beyond fleet capabilities. Depot-level maintenance periods can last 6 months or longer, and the Navy generally schedules them every 2 to 3 years throughout a ship’s service life.<sup>13</sup> This can include major repair, overhaul, or complete rebuilding of systems needed for ships to reach their expected service life. The maintenance involves complex structural, mechanical, and electrical repairs. For example, in certain types of depot-level maintenance, ships are taken out of the water and put into a dry dock to perform maintenance on below-water parts of the ship. In 2022, we reported that delays in depot maintenance can directly affect the services’ readiness by hindering their ability to conduct training and operations using systems such as aircraft carriers and submarines.<sup>14</sup>

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## Responsibilities for Sailor-Led Maintenance

Several organizations and commands within the Navy participate in setting maintenance policies and planning; assigning shipboard maintenance personnel; formulating budget requests that include resources for parts and materials; and coordinating, scheduling, and executing ship maintenance (see fig. 2).

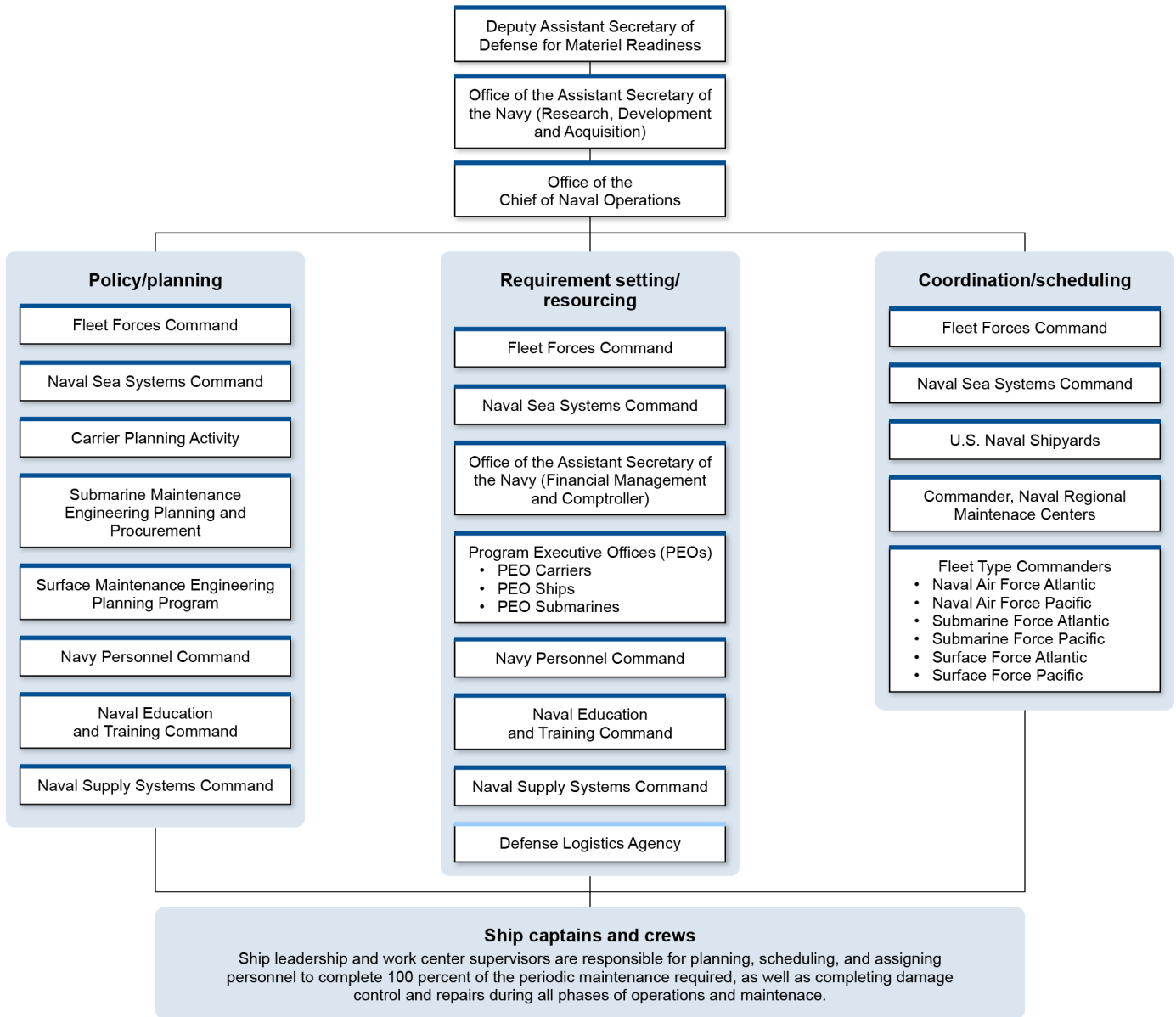
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<sup>12</sup>Naval vessels homeported in the U.S. or Guam may not be overhauled, repaired, or maintained in a shipyard outside of the U.S. or Guam. However, vessels may be repaired in foreign shipyards if the repairs are voyage repairs, or necessary to correct damage sustained due to hostile actions or interventions. 10 U.S.C. § 8680. For more information, see GAO, *Navy Ship Maintenance: Actions Needed to Address Maintenance Delays for Surface Ships Based Overseas*, [GAO-20-86](#) (Washington, D.C.: Feb. 26, 2020), and *Navy Ship Maintenance: Actions Needed to Monitor and Address the Performance of Intermediate Maintenance Periods*, [GAO-22-104510](#) (Washington, D.C.: Feb. 8, 2022).

<sup>13</sup>The Navy refers to these regularly scheduled depot-level maintenance periods as CNO availabilities, but for the purposes of this report we refer to them as depot-level maintenance periods. Some depot-level maintenance tasks may be accomplished outside of these maintenance periods, such as during continuous or voyage repair maintenance periods, but these periods are for brief or emergency ship maintenance needs, respectively.

<sup>14</sup>For more information, see GAO, *Military Depots: DOD Strategy for Addressing Deteriorating Facilities and Equipment is Incomplete*, [GAO-22-105009](#) (Washington, D.C.: May 9, 2022).

**Figure 2: Selected Navy Organizations That Participate in Planning, Resourcing, and Coordinating Sailor-Led Maintenance**



Source: GAO presentation of U.S. Navy information. | GAO-24-106525

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The ships' commanding officers and crews are responsible for the proper self-assessment, preservation, repair, maintenance, and operation of the ship, and for cost-effective management of sailor-led maintenance.<sup>15</sup> Ship commanding officers and crews are also expected to improve self-sufficiency and assign tasks which are beyond their capability to intermediate- or depot-level maintenance facilities for completion, as appropriate.

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## Assignment of Personnel

**Personnel requirements.** Personnel requirements identify the type and number of sailors needed to perform the Navy's work. Specifically, the personnel requirements define the type of personnel needed (e.g., enlisted or officer) and the required duties, tasks, and functions, as well as the specific skill level required to perform the functions for a position. The Navy Manpower Analysis Center determines and validates personnel requirements, to include those for ships, through workload studies conducted at least every 5 years. The Navy Manpower Analysis Center then uses these workload studies to produce a Ship Manpower Document (SMD) that presents validated personnel requirements (or validated requirements) for each ship.

**Funded positions.** Funded positions are those assignments to which the Navy has allocated funding from its appropriations.<sup>16</sup> Ship Manpower Documents and Activity Manpower Documents (SMD and AMD, respectively) are the qualitative and quantitative expressions of manpower requirements and funded positions allocated to a naval activity. SMDs and AMDs are the single official statement of organizational manning and funded positions.

**Assigned personnel.** The Navy assigns personnel to positions available on the ship. Assigned personnel are also called "current on board."

**Mustering personnel.** Individual Navy commands conduct daily meetings, referred to as "quarters," to communicate face-to-face; ensure all sailors are where they are supposed to be, share information, recognize good performance, conduct routine inspections, and match personnel with tasks that need to be completed, including maintenance and repairs, according to Navy guidance and officials.<sup>17</sup> Mustering

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<sup>15</sup>OPNAVINST 4700.7M.

<sup>16</sup>The Navy also refers to these positions as "billets authorized."

<sup>17</sup>OPNAVINST 3120.32D, *Standard Organization and Regulations Manual of the U.S. Navy* (July 16, 2012) (incorporating Change 1, May 15, 2017).

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personnel include those reporting to quarters, whether formally assigned to the command they report to or borrowed from other commands.<sup>18</sup> Personnel who do not muster may be on leave, temporarily assigned to another command, or away without leave.

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## Parts and Equipment Tracking

The Navy maintains a supply list, known as the Coordinated Shipboard Allowance List (COSAL), for every ship.<sup>19</sup> The allowance list is a consolidated listing of the equipment, components, repair parts, consumables, and operating space items required for an individual ship to perform its operational mission. The allowance list recommends which items should be stocked by the supply department or held in the custody of other departments to support the equipment known to be installed on the ship.<sup>20</sup>

The Navy tracks several measures of allowance list effectiveness, or the extent to which required items are aboard a ship. These include gross effectiveness, or the probability that any requested item is onboard when needed. The goal for shipboard gross effectiveness is 65 percent, with higher goals for certain ship types.

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## Shortages of Trained Sailors Aboard Ships Hinder Navy's Ability to Complete Required Maintenance

The Navy faces numerous interrelated, cyclical personnel and training challenges that hinder its ability to complete required maintenance, as shown in figure 3. Specifically, the Navy

- Assigns fewer sailors fleetwide than required aboard ships;
- provides initial skills training and on-the-job training that sailors describe as inadequate; and
- does not tailor ship maintenance tasks to address each ship's unique needs and these tasks can be inaccurate.

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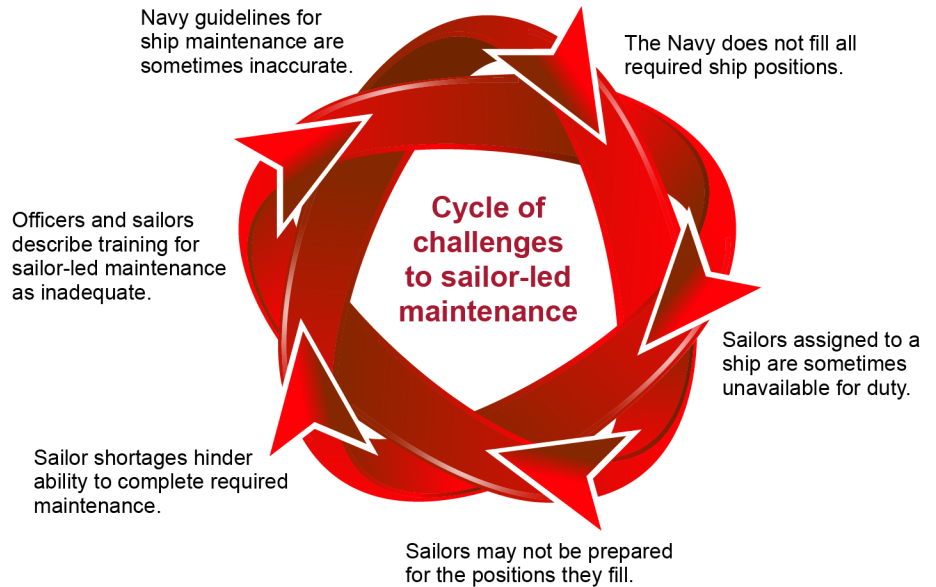
<sup>18</sup> OPNAVINST 3120.32D.

<sup>19</sup>The COSAL is an Integrated Logistics Support document that provides technical and supply information. It is a technical document to the extent that equipment, parts, and operating characteristics, for example, are described in Allowance Parts Lists (APLs) or Allowance Equipage Lists (AELs). It is also a supply document since it lists the items required to achieve maximum self-supporting capability for an extended period of time.

<sup>20</sup>Naval Supply Systems Command (NAVSUP) Publication (P)-488, *Coordinated Shipboard Allowance List Use and Maintenance Manual* (July 15, 2014).



**Figure 3: Cycle of Identified Interrelated Personnel and Training Challenges Inhibiting Sailor-Led Maintenance**



Source: GAO analysis of Navy information (text); ryno/stock.adobe.com (cycle). | GAO-24-106525

**Specifically:**

- The Navy assigns fewer sailors fleetwide than required aboard ships because it does not fill all required ship positions; ensure sailors assigned to a ship are available for duty; and ensure sailors are prepared for positions they fill. Sailor shortages hinder the Navy’s ability to complete required maintenance.
- The Navy provides initial skills training and on-the-job training for sailor-led maintenance that officers and sailors describe as inadequate.
- The Navy does not tailor ship maintenance tasks to address each ship’s unique needs and these tasks can be inaccurate.

Each of these challenges is discussed further below.

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## The Navy Regularly Assigns Fewer Sailors Fleetwide Than Required Aboard Ships

### The Navy Does Not Fill All Required Ship Positions

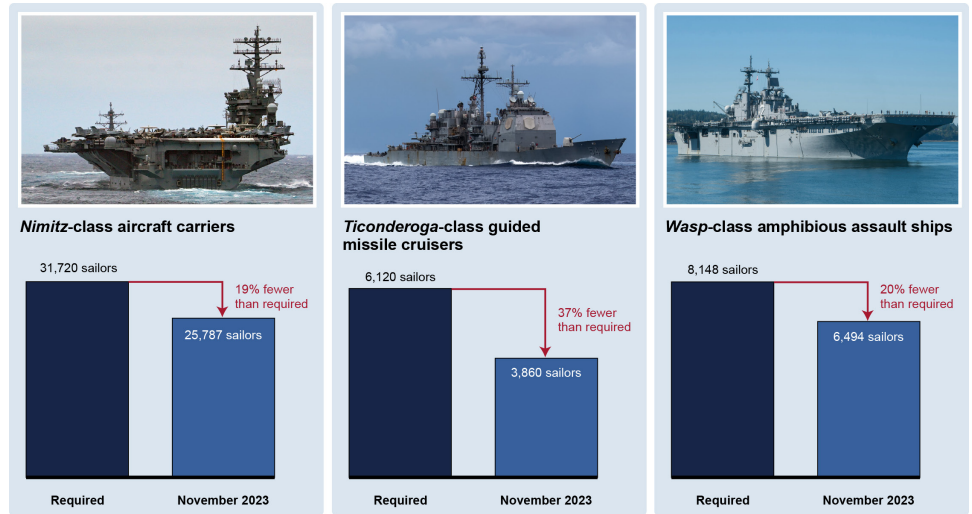
The Navy does not fill all required ship positions. We found that across the fleet, the Navy is assigning fewer personnel to positions than required based on SMDs produced by the Navy Manpower Analysis Center (NAVMAC) that establish requirements based on ships' projected missions.<sup>21</sup> For example, we recently reported that the Navy requires 84,379 enlisted sailors across aircraft carriers, surface ships, and attack submarines.<sup>22</sup> However, as of November 2023, the Navy had 70,705 enlisted sailors on board, or approximately 16 percent fewer sailors than required. Additionally, we found that certain classes of ships—such as *Nimitz*-class aircraft carriers, *Ticonderoga*-class guided missile cruisers, and *Wasp*-class amphibious assault ships—had far fewer enlisted sailors on board than SMD-established requirements to safely operate them (see fig. 4).

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<sup>21</sup>The U.S. Navy Manpower Analysis Center produces the SMDs.

<sup>22</sup>GAO, *Navy Readiness: Actions Needed to Improve the Reliability and Management of Ship Crewing Data*, [GAO-24-105811](#) (Washington, D.C.: Apr. 29, 2024). This report included the ship classes that we surveyed, excluding Littoral Combat Ships, Zumwalt-class destroyers, and Ohio-class submarines.

**Figure 4: Sailors Required and Assigned for Selected Ship Classes**



Source: GAO analysis of U.S. Navy data; U.S. Navy/Mass Communication Specialist 3rd Class A. Langhoff (Nimitz); U.S. Navy/Mass Communication Specialist 2nd Class N. Bauer (Ticonderoga); U.S. Navy/Mass Communication Specialist 2nd Class J. A. Willadsen (Wasp). | GAO-24-106525

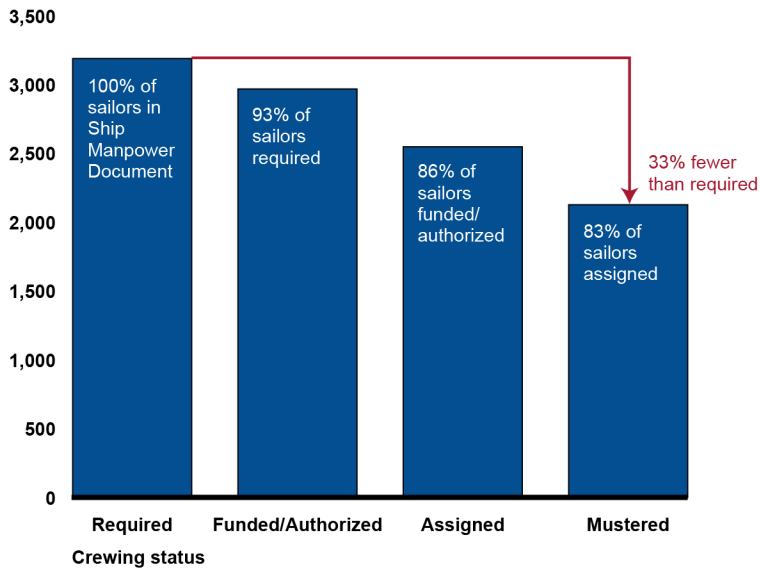
### Sailors Assigned to a Ship Are Sometimes Unavailable for Duty

Sailors who are assigned to a specific ship are sometimes unavailable for duty. They may not muster due to, for example, illness or being temporarily assigned for duty on another ship, or they may muster but still be unavailable to perform sailor-led maintenance, according to our discussion groups and analysis. For example, sailors on an amphibious ship that we visited said that personnel with specialized skills (e.g., rescue swimmers) may be aboard a ship but unavailable to perform maintenance because their specialized skills can take priority. Personnel on another ship we visited said that sailors can also be diverted from assigned duties to fill other gaps.

We obtained Navy mustering data for some of the ships we visited, and we also compared the mustering data with levels for personnel required, funded, and assigned to one aircraft carrier on a sample day in port as shown in figure 5.<sup>23</sup> Of those sailors assigned, we found that about 83 percent were mustered.

<sup>23</sup>As previously noted, mustering personnel include those reporting to quarters, whether formally assigned to the command they report to or borrowed from other commands. Personnel who do not muster may be on leave, temporarily assigned to another command, or away without leave. We did not assess the reliability of the mustering data provided by Navy officials from the various ships we visited.

**Figure 5: Example of Navy Aircraft Carrier Sailors Mustering for a Weekday in Port**  
 Number of crew



Source: GAO analysis of Navy data. | GAO-24-106525

Note: Data from the USS *George HW Bush* (CVN-77) as of Oct. 25, 2023. Mustering crew are those who are on board and available on a given day.

Similar conditions existed aboard surface ships and submarines we visited during fiscal year 2023. For example, one submarine we visited mustered about 89 percent of its assigned crew. Another submarine had 18 authorized billets in its auxiliary division. This is a maintenance-heavy division responsible for electrical power generation, ship ventilation, and heat and refrigeration, among other major equipment. Twelve sailors mustered for duty, of whom three were reassigned from other ships to assist. This increases the workload for more experienced sailors because they are also expected to train the junior sailors, according to discussion group members from this submarine.

We met with Navy personnel officials who were responsible for monitoring numbers of sailors assigned to each ship. However, these officials did not know how those compared with numbers mustering, or available on a given day. Officials in the offices of the deputy Chief of Naval Operations for Personnel, Manpower, and Training and Navy Manpower Analysis Center said that their offices did not collect mustering information at the CNO level, but that it might be collected by Fleet Forces Command. However, Fleet Forces Command officials said that the command does

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## Sailors May Not Be Prepared for the Positions They Fill

not require ships to report mustering information and does not collect this information.

Sailors may not be prepared for the positions they fill, according to our analysis. Sailors assigned to maintenance-heavy positions may be less experienced than other sailors on that same ship. The Navy uses a measure known as Quality of Alignment that provides a summary measure of sailors' seniority and qualifications to assess how well they are prepared for the positions they fill.<sup>24</sup> All sailors are expected to perform maintenance to some extent, but some departments require sailors to perform more maintenance than others, according to Navy officials. For example, the engineering department is more likely to perform more frequent and intensive maintenance than the executive or supply departments.

The Navy reports quality of alignment on a 7-point scale, where "1" represents a perfect match between a sailor's skill and position; "2" and "3" are good; "4" and "5" are fair; and "6" generally represents the lowest. A score of "7" occurs when a data change to the billet or the sailor's record renders the alignment invalid.<sup>25</sup> We compared quality of alignment data for engineering and other major ship departments in the 25 ships we visited.

For most ships (19 out of 25), the engineering departments had lower (i.e., worse) alignment scores than the average for their ships. Most engineering department averages were between 2 and 3, with about one-third of sailors having scores lower (worse) than 3. Engineering department scores in general were similar to those of combat systems department scores but were lower than the scores for the operations departments and navigation departments.<sup>26</sup> Because we collected data on a non-generalizable sample of ships, we cannot definitively state that all sailors with heavy maintenance workloads fleetwide are less experienced or possess fewer advanced skills than other sailors.

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<sup>24</sup>The Quality of Alignment enables the Navy to consider how best a sailor aligns to the rating, pay grade, or some other Navy enlisted classification requirement of a position.

<sup>25</sup>A Quality of Alignment score of "7" is system-generated and cannot be manually assigned. According to the MNA user's guide, an alignment score of 7 should be immediately evaluated and alignment change recommendations submitted. Navy, *My Navy Assignment (MNA) User's Guide*, version 3.0i (Feb. 14, 2022).

<sup>26</sup>We used the engineering department as a proxy for maintenance-heavy positions. Other major departments on ships, such as operations and combat systems, also perform maintenance.

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However, these results are consistent with the survey responses that we obtained from executive officers from across the fleet, as discussed elsewhere in this report.

## Sailor Shortages Hinder Ability to Complete Required Maintenance

Sailor shortages hinder sailors' ability to complete required maintenance, according to survey respondents; interviews with sailors from our ship visits; and our review of data from Fleet Forces Command.

### Selected Quotes from Ship Officers and Crew Regarding Impact of Personnel Levels Aboard Ships

"We do not have the adequate manning to get the job done in a timely manner."

"The Navy has not provided crew levels sufficient to meet the ship maintenance workload."

"Manning levels make it extremely difficult to perform maintenance leading to increased repairs that have to be done."

"Manning shortfalls—at all levels (supervisor, journeymen, apprentices)—inhibit the ability of ship's force to drive material readiness to optimal levels."

"There are not enough man hours to complete everything, especially in port when we don't have everybody onboard all the time. Corrective maintenance is even harder, especially underway when we can't get a technical representative onboard easily."

"More capable sailors that perform a lot of maintenance get burned out and tired of taking up the slack for other sailors and leave the Navy to do the same work for better pay and working conditions."

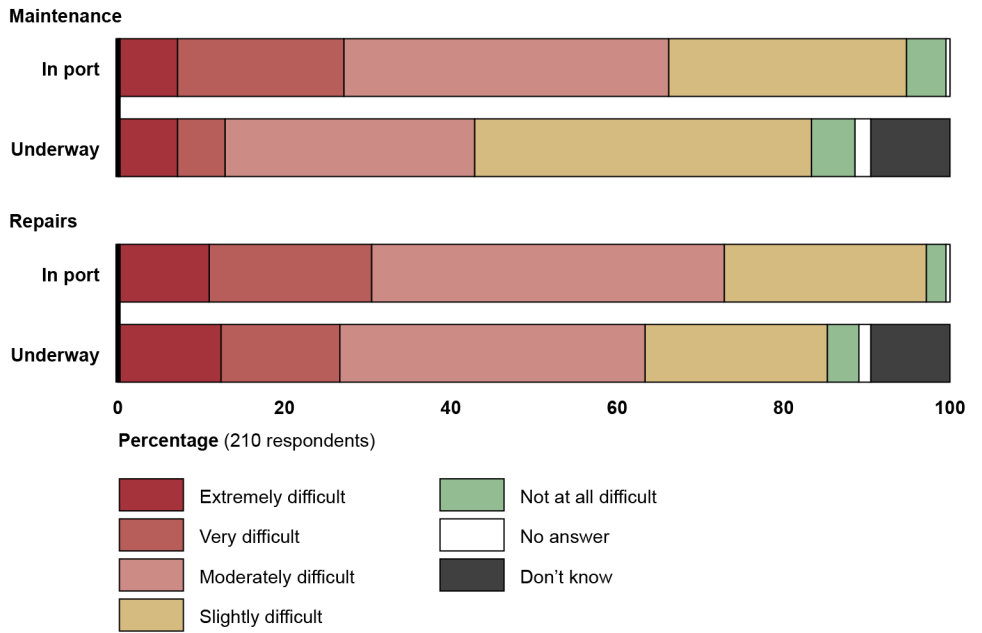
Source: GAO selections from survey responses and interviews with ships' sailors. | GAO-24-106525

**Survey respondents.** According to 63 percent of Navy executive officers who completed our survey, it is moderately to extremely difficult to conduct repairs while underway with the number of sailors assigned to their ships (see fig. 6).<sup>27</sup>

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<sup>27</sup>We conducted a survey of the active Navy battle fleet, with executive officers for each ship completing the survey on behalf of their ship after consulting with others who are familiar with the topic. The response rate for the active battle fleet within the scope of our review was 91 percent. See appendix I for a copy of the survey.

**Figure 6: Ship Survey Responses About the Difficulty of Completing Sailor-Led Maintenance and Repairs in Port or Underway**



Source: GAO analysis of survey results. | GAO-24-106525

Fewer officers—about 43 percent—responded that it is moderately to extremely difficult to conduct sailor-led maintenance when a ship is underway, since sailors are less likely to be away from the ship for competing priorities such as leave or training. On one operational ship we visited that had 79 percent of required sailors assigned, Navy officers said that it was difficult for sailors to complete all planned maintenance and repairs, in addition to administrative tasks and watch-standing duties (see sidebar).

**Sailors.** According to sailors on the ships we visited, increased workloads can lead to fatigue risks to readiness, and low morale. As we recently reported, fatigue caused by inadequate sleep can negatively affect a service member’s performance and has contributed to accidents resulting

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in deaths and hundreds of millions of dollars in damage to ships, vehicles, and aircraft.<sup>28</sup>

**Data.** We also reviewed recent data on fleet material readiness (maintenance accomplishment).<sup>29</sup> The Fleet Analysis Center at Fleet Forces Command produces a semi-annual review that provides information on, among other things, trends in maintenance backlogs. Specifically, we focused on trends in the backlog of sailor-led maintenance actions and reviewed two categories: total backlog and mission-limiting backlog.

During fiscal year 2023, the total sailor-led maintenance backlog declined fleetwide. More specifically, it declined for carriers and surface ships, but increased for submarines. The Navy classifies a subset of maintenance actions as mission-limiting based on their priority and impact. These accounted for about 3 percent of the total during fiscal year 2023. This mission-limiting backlog worsened over the past year, increasing by about 8 percent (see fig. 7).

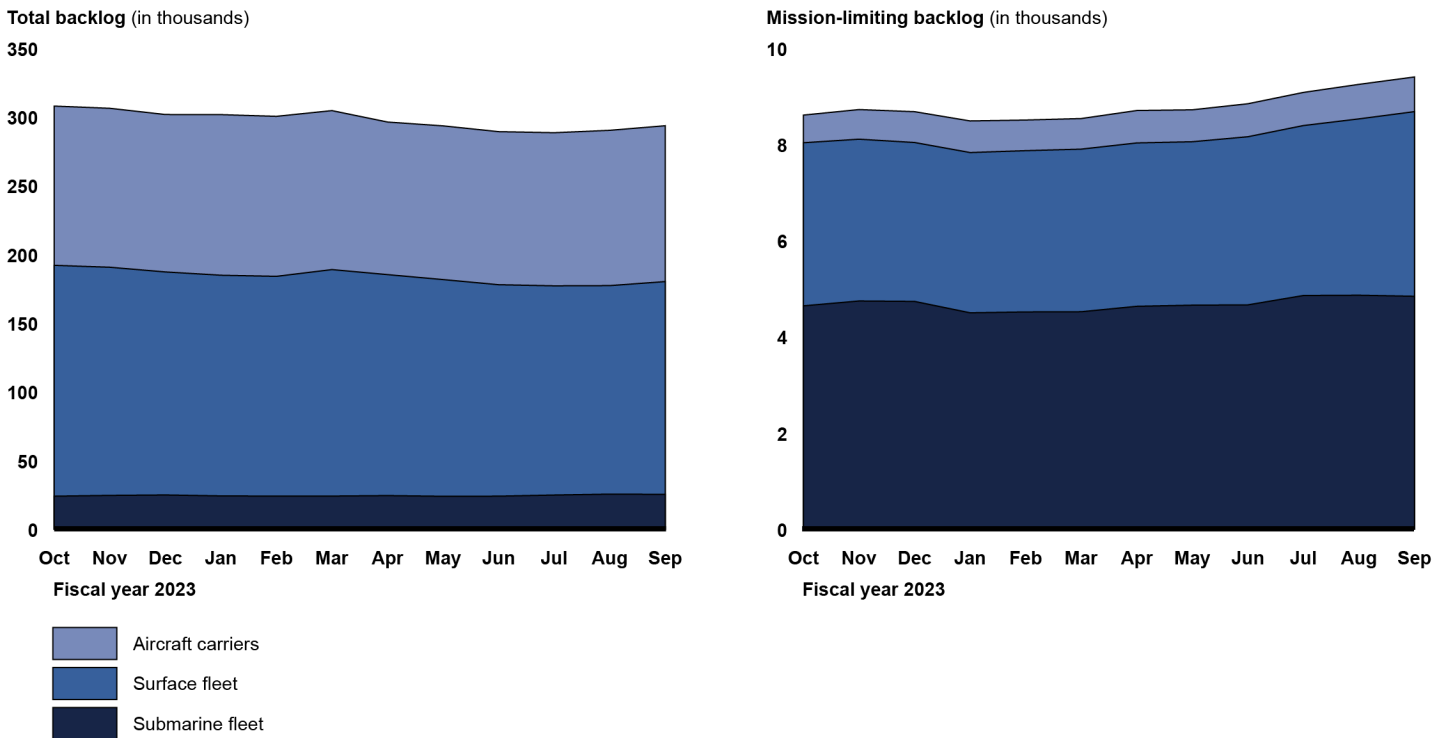
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<sup>28</sup>GAO, *Military Readiness: Comprehensive Approach Needed to Address Service Member Fatigue and Manage Related Efforts*, [GAO-24-105917](#) (Washington, D.C.: Mar. 26, 2024). GAO has made numerous recommendations to address sailor fatigue. For example, in 2021 we recommended that the Secretary of the Navy should ensure that the Office of Chief of Naval Operations and the Commander, U.S. Fleet Forces Command and Commander, U.S. Pacific Fleet take actions to address the factors causing sailor fatigue and inadequate sleep. DOD concurred with this recommendation. The Navy's fiscal year 2022 Afloat Safety Climate Assessment Survey (CUI) found that workload and uncomfortable mattresses, respectively, are the two leading factors causing inadequate sleep and fatigue. As of October 2023, the Navy had not addressed the enduring personnel shortfalls causing heavy workload or the issue of uncomfortable mattresses. See [GAO-21-366](#).

<sup>29</sup>U.S. Fleet Forces Command, which provided the data, is a shore command whose missions are to train, certify, and provide combat-ready forces; plan and execute assigned service functions; provide operational planning and coordination support; and plan and execute joint missions.



**Figure 7: Sailor-Led Maintenance Action Backlogs for Fiscal Year 2023**



Source: GAO analysis of U.S. Navy data. | GAO-24-106525

Note: The backlog refers to the number of jobs not completed without regard to how much time each requires.

**Navy’s 30-Year Shipbuilding Plan Calls for as Many as 381 Manned Ships**

“Naval Forces are in high demand...However, as we look to the future force required, every study conducted since 2016 highlights a need for a larger Navy with a mix of manned and unmanned platforms. The recent Battle Force Ship Assessment Requirements report highlighted the need for 381 manned ships.”

Source: Advance Policy Questions for Admiral Lisa M. Franchetti. | GAO-24-106525

The Navy has reported plans to increase the number of ships in the fleet (see sidebar). However, Navy officials acknowledge that there are not enough personnel Navy-wide to conduct sailor-led maintenance on existing ships. As of January 2024, the Navy reported having enlisted end strength of about 277,000, or nearly 25,000 below its target, and the numbers have been trending downward for more than a year. Out of the 277,000 sailors total, nearly 47,000 sailors had deployment limitations, which further shrinks the number of sailors who are available to perform sailor-led maintenance aboard ships.<sup>30</sup>

According to Navy maintenance policy, maintenance of ship systems and equipment will be performed by qualified personnel using correct

<sup>30</sup>More than 15,000 sailors were classified as non-deployable and more than 31,000 were classified as being in Individual Medical Readiness deficit (temporarily non-deployable).

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procedures and material per the technical requirements issued by the appropriate technical authority.<sup>31</sup> Additionally, separate Navy guidance concerning manpower states that manpower requirements identify the type and level of strength needed to perform the Navy's work.<sup>32</sup> Each manpower requirement equates to a specific position and level of qualifications that define the desired duties, tasks, and functions to be performed. Moreover, Navy policy on enlisted manning policy and procedures states that personnel readiness is maintained through the timely assignment and alignment of qualified personnel to support the command mission.<sup>33</sup> According to this same policy, several Navy metrics used to monitor manning are based on personnel currently on board the ship.

However, Navy policy does not require the Navy to gather and report personnel data specific to sailor-led maintenance. And although policy requires the Navy to compare funded/authorized positions to assigned personnel, it does not require the Navy to compare assigned personnel to mustering personnel or to track the quality of sailors' alignment across departments.<sup>34</sup>

*Standards for internal Control in the Federal Government* states that management should use quality information to achieve the entity's objectives.<sup>35</sup> Updating Navy policy to require that the Navy periodically gather and report data specific to sailor-led maintenance, such as comparing assigned personnel to the number of actual mustering personnel available for duty, could improve the Navy's oversight and ability to accurately report its manning and any associated effects of maintenance of ships. Furthermore, such information, if gathered and reported at regular intervals, could enable the Navy to improve its

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<sup>31</sup>OPNAVINST 4700.7M.

<sup>32</sup>OPNAVINST 1000.16L, *Navy Total Force Manpower Policies and Procedures* (June 24, 2015 (incorporating Change 3, July 2, 2021).

<sup>33</sup>OPNAVINST 1300.21, *Enlisted Manning Policy and Procedures* (June 23, 2022).

<sup>34</sup>See also GAO, *Navy Readiness: Actions Needed to Improve the Reliability and Management of Ship Crewing Data*, [GAO-24-105811](#) (Washington, D.C.: Apr. 29, 2024) which discusses inaccuracies regarding authorization levels.

<sup>35</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 2014) Quality information is appropriate, current, complete, accurate, accessible, and provided on a timely basis.

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quarterly or semi-annual readiness reporting to Congress, improving the visibility of challenges affecting the condition of ships.<sup>36</sup>

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## The Navy Provides Maintenance Training That Officers and Sailors Describe as Inadequate

The Navy provides training for sailor-led maintenance that both officers and sailors described as inadequate to meet their needs. Specifically, sailors expressed dissatisfaction with both the quality of training—whether it prepares them to perform maintenance aboard ship—and the format in which training is delivered.

After recruit training (boot camp), sailors attend an initial skills training course—commonly known as “A” school—that covers topics such as how to read a technical manual and perform basic maintenance. Initial skills training, which the Navy also sometimes refers to as formal or schoolhouse training, is generally delivered by an instructor and supplemented by computer-based training. After this course, sailors are assigned to a ship to obtain on-the-job training on how to repair specific pieces of equipment.<sup>37</sup> Figure 8 depicts typical formats of initial skills and on-the-job training.

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<sup>36</sup>Section 597 of the NDAA for Fiscal Year 2020 requires the Navy, under certain circumstances, to measure manning levels using personnel requirements from the SMD, Pub. L. No. 116–92, § 597 (2019). We recently reported that readiness data are not sufficiently reliable or transparent. Specifically, we reported the Navy applies some calculation rules to readiness data that result in counting some junior enlisted sailors as filling positions that require more senior-level sailors, and that personnel requirements data in the Navy’s authoritative system was sometimes lower and sometimes higher than validated requirements. [GAO-24-105811](#).

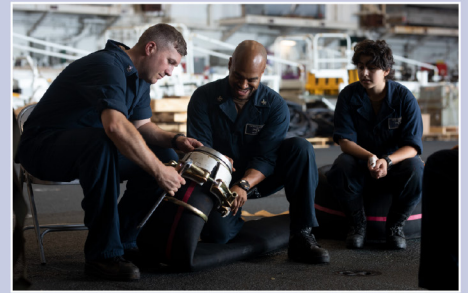
<sup>37</sup>Sailors may complete recruit training (boot camp) and then move to initial skills training or “A” school”. During “A” school, junior sailors receive the technical training for their selected occupation prior to their first sea tour. The Navy also refers to formal, on-site instructor-led training provided in “A school” as schoolhouse training. The Navy in 2001 adopted a policy referred to as optimal manning—as well as a series of other policy changes—to reduce emphasis on teaching comprehensive maintenance and repair concepts and techniques and increase emphasis on teaching sailors how to operate weapon systems, according to Navy documents. The Navy changed its approach in part due to sailors’ preference for on-the-job training, and in part to get them to the fleet faster. For more information see [GAO-22-104510](#).

**Figure 8: Typical Formats of Initial Skills and On-the-Job Training**



**Initial skills training**  
(known as “A School”, formal, or schoolhouse)

- Instructor-led, formal course
- Computer-based lessons (part of curriculum)
- “Hands on” sessions



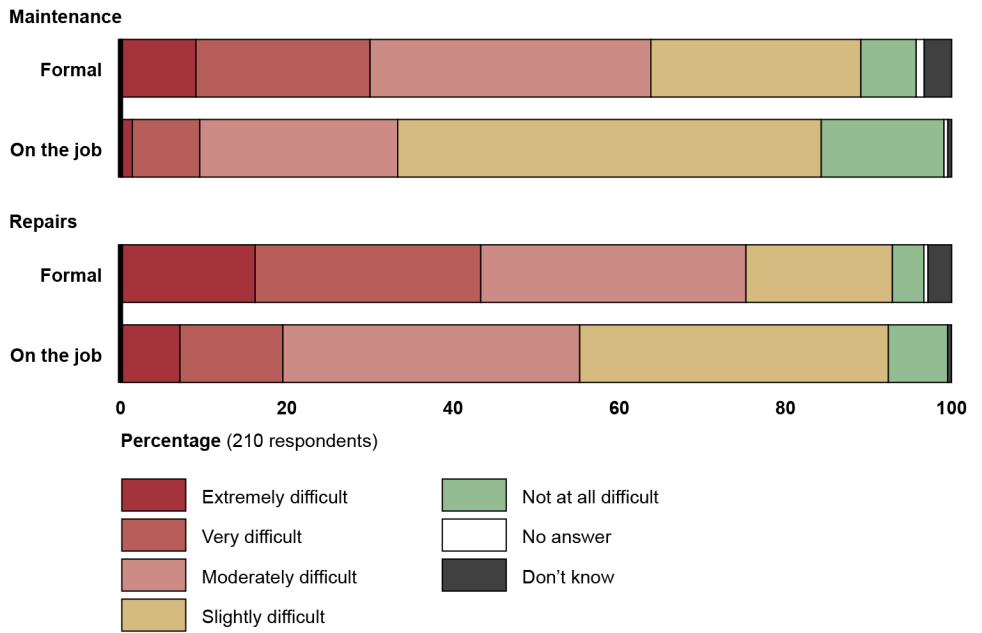
**On the job training**

- Provided by senior sailors
- Computer-based (self-paced)

Source: GAO analysis of Department of Defense information; U.S. Navy/Glenn Sircy (school photo); U.S. Navy/Seaman Darren Newell (job photo). | GAO-24-106525

On-the-job training after “A” school can allow junior sailors to learn how to accomplish a task in a manner that reinforces concepts taught in initial skills training at the schoolhouse. In general, sailors we met with prefer in-person on-the-job training provided by more experienced sailors aboard ship to classroom training. Survey respondents also considered it more difficult to complete both maintenance and repairs using formal rather than on-the-job training (see fig. 9).

**Figure 9: Ship Survey Responses About the Difficulty of Completing Maintenance and Repairs Using Different Types of Training**



Source: GAO analysis of survey results. | GAO-24-106525

Note: Formal training at the initial skills level is generally instructor-led and includes a mix of hands-on and theoretical topics. In-person on-the-job training is where a more experienced sailor shows a junior sailor how to accomplish a task. In general, officers reported challenges with each type but found completing maintenance and repairs to be less difficult with on-the-job training than formal training.

For example, of those who responded on behalf of their ship to our survey:

- When using formal training, 64 percent of executive officers said it is moderately to extremely difficult to conduct sailor-led maintenance, and 75 percent of executive officers found it moderately to extremely difficult for sailors to complete repairs.
- When using on-the-job training, 33 percent of executive officers said it is moderately to extremely difficult to conduct sailor-led maintenance, and 55 percent of executive officers found it moderately to extremely difficult to complete repairs.

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**Selected Quotes from Officers and Enlisted Sailors on Different Types of Training**

“Training is curtailed or omitted due to funding and manning shortages. This leads to knowledge gaps which require additional troubleshooting to overcome and over-reliance on the contractors and an inability for sailors to learn their equipment.”

“Accessing the Navy’s on-demand training for any type of maintenance can be very difficult onboard a ship due to the limited bandwidth... regardless of if we are in-port or underway.”

“More [maintenance] training should be conducted before a sailor arrives at their ship and while they are transitioning between commands.”

“Since the Navy has cut the length of schools, we’ve also made advancing easier, so senior personnel have less experience, so junior maintenance personnel and their supervisors may both be doing the same maintenance and repair tasks for the first time.”

“I know of no corrective maintenance training, and our ship does not have the bandwidth to view online training.”

“Sailors need hands-on maintenance training at schoolhouses working on live systems for maintenance and repairs. Online or on-demand systems are not reliable, and bandwidth is constrained underway.”

“The Navy has taken away too many schools and is making our sailors simply operators of the equipment. Most of the younger sailors have no idea how to perform proper troubleshooting.”

“Computer-based training and on-demand training cannot replace schoolhouse training.”

“Our delivery method and quality need to improve when it comes to training our Sailors in schools.”

“Some of the slides we saw in school included pictures of tools such as screwdrivers, and described how to use them, but you can’t learn that from a slide.”

Source: GAO selections from survey responses and interviews with ships’ crews. | GAO-24-106525

Sailors from ships that we visited also said that they did not learn enough at the schoolhouse to perform the work they were expected to do aboard ship (see sidebar).

For example, initial skills training usually does not cover troubleshooting, but sailors said they needed that skill in their first assignments to perform repairs or when reassembled systems do not work after completing planned maintenance. Officials from the Naval Education and Training Command confirmed that initial skills training curricula do not include troubleshooting, which is considered a journeyman-level skill and is typically taught during advanced skills training. However, they added that as sailors start to maintain systems in the fleet, they will develop troubleshooting ability.

Initial skills training, or “A” school, trains to selected enlisted occupational standards at an apprentice level (equivalent to an enlisted rank of E-4).<sup>38</sup> However, as we recently reported, Navy-wide personnel shortages sometimes mean that junior sailors fill more advanced journeyman

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<sup>38</sup>Occupational standards express the Navy’s minimum requirements for enlisted occupational skills. According to Navy policy, the knowledge required to perform a task is inherent to the proper performance of the task. Development of specific knowledge to support occupational standards falls under the purview of Navy training commands. Navy Personnel Command (NAVPERS) 18068F, *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards*, vol. 1 (Jan. 2023).

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roles.<sup>39</sup> Some sailors also reported that they were assigned to duties for which they were not trained, such as laundry duty, in order to fill shipboard gaps. They said that spending time on these assignments reduced their retention of knowledge gained in schoolhouse training.

The Navy is aware that sailors want additional training to conduct sailor-led maintenance. In response, the Navy is developing additional training, known as Ready Relevant Learning, that it believes will be more interactive and palatable to the sailors.<sup>40</sup> Ready Relevant Learning will include videos to support sailor-led maintenance during schoolhouse training, and the Navy also plans to make it available to sailors via cloud-based services and remote support, according to Navy officials. However, Ready Relevant Learning videos have not yet been developed for all maintenance specialties (e.g., electrical repair or mechanical repair), and they are also not available for use at sea.

The Naval Education and Training Command is responsible for ensuring that the quality of education and training programs meets fleet needs, and executes the Ready Relevant Learning program, among other duties.<sup>41</sup> The Naval Education and Training Command is also responsible for analyzing, designing, developing, and evaluating instructional programs and support materials; and for using feedback and analysis systems, evaluations, studies, and other appropriate methods, for fleet training requirements.

However, the Naval Education and Training Command has not evaluated and optimized the balance between classroom training and on-the-job training to ensure that training for sailor-led maintenance 1) improves sailor's capabilities to perform maintenance and repairs, and 2) enhances the Navy's ability to maintain combat-ready ships, aircraft carriers, and

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<sup>39</sup>[GAO-24-105811](#).

<sup>40</sup>We reported in May 2021 that the Navy was implementing and evaluating Ready Relevant Learning. See *Navy Readiness: Additional Efforts are Needed to Manage Fatigue, Reduce Crewing Shortfalls, and Implement Training*, [GAO-21-366](#) (May 27, 2021). In a follow-up report, we found that the Navy, as of September 2023, had implemented some aspects of Ready Relevant Learning, such as the block learning for enlisted sailor occupations. However, the Navy was still working to fully implement other aspects of Ready Relevant Learning, such as requirements development. GAO, *Navy Readiness: Challenges to Addressing Sailor Fatigue in the Surface Fleet Continue*, [GAO-24-106819](#) (Washington, D.C.: Oct. 11, 2023).

<sup>41</sup>OPNAVINST 5450.336D, *Mission, Functions, and Tasks of the Naval Education and Training Command* (April 11, 2018).

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submarines. However, the Ready Relevant Learning program is intended to modernize how the Navy trains its sailors, including ensuring training is more interactive and palatable to sailors, in part by developing performance support tools for sailors (e.g., how-to videos and annotated diagrams) that can be used during schoolhouse training, and aboard ships, according to Navy officials. As we were concluding our review in spring 2024, a Navy official said that the Navy had recently begun delivery of performance support videos to sailors on ships that are available while underway.

In January 2023, the Navy issued its *Ready Relevant Learning Training Effectiveness and Assessment Process Manual*.<sup>42</sup> There are currently no Navy-wide standardized measures, assessment methodology, or automated information technology systems in place to collectively evaluate the effectiveness of learning accurately and holistically in the fleet, according to the manual. A Navy official stated that the ability to assess individual performance of sailors, and how training has affected that individual performance, is a key line of effort of the Ready Relevant Learning program and that implementation of the manual is in progress.

By ensuring that it evaluates and optimizes the mix of learning formats as part of its implementation of Ready Relevant Learning, the Navy could improve sailors' ability to conduct sailor-led maintenance and repairs aboard ships, aircraft carriers, and submarines, which could be especially useful for junior (apprentice) sailors who fill more senior (journeyman) roles.

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### Navy Guidelines for Ship Maintenance Tasks Are Sometimes Inaccurate and Not Tailored to Personnel Experience Level

The Navy has developed guidelines that describe the step-by-step process of completing each ship maintenance task. However, these guidelines, or Maintenance Requirement Cards (maintenance cards), are sometimes inaccurate and may be based on unrealistic assumptions regarding numbers and experience levels of maintenance personnel.

**Inaccurate guidelines.** Maintenance cards contain features such as technical drawings and guidance necessary to complete sailor-led maintenance tasks. These are often incomplete or inaccurate, according to sailors and work center supervisors who participated in our discussion groups (see sidebar). For example, on one ship we visited, we discovered that modifications to the ship's electrical system had not been

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<sup>42</sup>USFLTFORCOM, *Ready Relevant Learning Training Effectiveness and Assessment Process Manual: Sailor 2025 (S2025) Ready Relevant Learning (RRL)* (3 January 2023).



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**Selected Quotes from Ship Officers and Crew Regarding the Accuracy of Maintenance Guidelines**

“Maintenance Requirement Cards are written in a [confusing manner]. Ship configuration is so different from one ship to another of the same type [and we are expecting a 19-year young adult to know what alterations the ship has received].”

“The maintenance procedures themselves tend to be vague and overly complicated. We could get a lot of man hours back by writing clearer procedures with simple instructions and plenty of drawings.”

“The system used to document and communicate required repairs seems to not be ready for use. It does not replicate effectively off ship, causing additional man-hours to be expended by ship’s force and the port engineer ashore. With limited manning, systems need to work as intended.”

“Each time a ship comes out of intermediate- or depot-level maintenance, they are forced to play catch up in corrective maintenance and don’t have enough accessibility to technical support. Again, when compounded with the lack of new system technical documentation, it [reduces readiness] for critical systems.

Source: GAO selections from survey responses and interviews with ships’ crews. | GAO-24-106525

documented. To complete maintenance and repairs, the sailors had to create their own diagrams mapping out shipboard electrical circuits.

We observed instances of maintenance aboard different ships that necessitated more sailors, more time, or both than the number of personnel and the amount of time specified on maintenance cards. For example, we observed:

- For safety reasons, two sailors were needed for maintenance on a high voltage circuit, but the card describing the maintenance procedures identified that this task only required one sailor.
- Three sailors were needed to perform maintenance on a gun turret and ensure that the movement of the gun mount was unobstructed, but the card describing maintenance procedures identified that this task only required two sailors.

Each maintenance card lists all the materials and personnel needed and the average time needed to complete each task. Navy guidance states that the maintenance requirement card reflects the average time per equipment, per person and does not reflect or account for gathering and putting away tools, tag-outs, or time removing and replacing parts or equipment.<sup>43</sup> Rather, the Navy uses a formula to add 30 percent more time to each estimate to allow for set-up, tear-down, and clean-up.<sup>44</sup>

However, the workload required, and the number of personnel needed to complete all required maintenance aboard a specific vessel can vary greatly, even if the tasks being completed are very similar. For example, sailors on a destroyer told us that their ship’s hazardous material check-out is open for a limited number of hours per day, so sailors cannot obtain materials promptly if a need is discovered at another time. According to officers aboard ships we visited and Navy officials, it takes longer to perform set-up and clean-up tasks than the Navy allocates in its standard planning factor. In addition, ships vary even within the same class—for example there are four different types of Arleigh Burke-class destroyer—

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<sup>43</sup>Commander, Naval Sea Systems Command (NAVSEA) Instruction (INST) 4790.8D, *Ships’ Maintenance and Material Management Manual* (June 17, 2021).

<sup>44</sup>We reported in 2017 that the Navy changed this factor twice since 2002. In 2002, the Navy reduced this allowance without required analysis from 30 percent to 15 percent of the total preventive maintenance man hours required on the ship. In 2012, the Navy assessed the allowance, and in 2013 restored it to 30 percent. GAO, *Navy Force Structure: Actions Needed to Ensure Proper Size and Composition of Ship Crews*, GAO-17-413 (Washington, D.C.: May 18, 2017).

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and even ships within a class can carry different equipment. Moreover, guidance states that the standard does not mean the maintainer is expected to robotically follow the maintenance card word-for-word.

However, guidelines do not account for extra time sailors spend before or after maintenance because (1) Navy ship maintenance policy does not provide commanding officers a sufficient role in updating maintenance cards, and (2) the Navy does not ensure that maintenance cards reflect realistic information regarding the number of personnel available to conduct maintenance and their experience level.<sup>45</sup>

First, Navy maintenance policy for ships states that the commanding officer has overall responsibility and authority within resource limitations to improve ship self-sufficiency.<sup>46</sup> Specifically, the commanding officer is responsible for ensuring that the current ship's maintenance is completed and up to date so that the ship can execute its assigned missions. However, ship commanding officers currently have a limited role in updating maintenance cards for ships. In general, shipboard personnel cannot change maintenance cards. When maintainers discover issues, they may submit feedback reports via their ship's executive officer to their applicable type commander. If a feedback report is technical in nature, and involves safety of personnel, ship, or equipment, the maintenance card procedure is followed as written, and the report is forwarded to Naval Sea Logistics Center, the cognizant systems commander, and the type commander, among others, for resolution.<sup>47</sup> However, this process is cumbersome and ineffective, according to Navy officers and Navy officials. For example, officers aboard a ship we visited said that getting corrections to an inaccurate maintenance card took several months and resulted in corrections to the guidelines for a group of ships even though the requested change was only needed for one ship.

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<sup>45</sup>Although our review is related to sailor-led maintenance aboard ships, the same guidance applies to shore commands, with similar conditions and challenges affecting type commands such as the commander, Naval Information Forces which is responsible for 108 platforms critical to Navy and DOD operations including Naval Computer and Telecommunications Stations (NCTS), Naval Computer and Telecommunications Area Master Stations, Maritime Operations Centers, and Intelligence Commands.

<sup>46</sup>OPNAVINST 4700.7M.

<sup>47</sup>Navy guidance also assigns responsibility to the commander of Naval Sea Systems Command to develop, review, and validate maintenance requirements and to develop, issue, and maintain organizational-level requirements (including maintenance cards), and intermediate-level and depot-level class maintenance tasks.

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Updating policy to include commanding officers as key stakeholders in updating maintenance cards could allow these officers a greater voice about conditions specific to their ship or ship class such as the actual time expended in accomplishing sailor-led maintenance tasks. Moreover, the Navy uses information about its maintenance requirements as an input into development of its SMD, which specifies manning and experience requirements for each ship class.<sup>48</sup> Without accurate maintenance cards, the Navy also risks compromising the accuracy of its SMD.

Second, the *Joint Fleet Maintenance Manual* states that procedures on maintenance cards are written at a level of detail based on the assumption that maintenance personnel are trained, qualified, and supervised by experienced leadership to execute the maintenance consistently and expertly.<sup>49</sup> However, the training, qualifications and supervision of sailors conducting maintenance may vary from ship to ship, according to our analysis and survey responses. Accordingly, procedures may not be written at an appropriate level of detail given current Navy shortfalls in numbers, training, qualifications, and the experience level of supervisors.<sup>50</sup>

Maintenance card accomplishment is critical for maintaining equipment in a ready state and achieving expected service life, according to Navy maintenance guidance.<sup>51</sup> Moreover, we have consistently reported that the Navy routinely assigned fewer crewmembers to its ships than its workload studies have determined are needed to safely operate and maintain them.<sup>52</sup> Without ensuring that its maintenance cards are written at an appropriate level of detail that better reflects the actual numbers and skill level of maintenance personnel, the Navy risks not being able to maintain equipment and not achieving the equipment's expected service life. The Navy also risks having an unrealistic expectation of the numbers

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<sup>48</sup>The purpose of the Navy's Ship Manpower Document is to determine the minimum number and quality of positions needed aboard ship.

<sup>49</sup>COMUSFLTFORCOMINST 4790.3.

<sup>50</sup>Although our review is related to sailor-led maintenance aboard ships, the same guidance applies to shore commands, with similar conditions and challenges affecting type commands such as the commander, Naval Information Forces which is responsible for 108 platforms critical to Navy and DOD operations including Naval Computer and Telecommunications Stations, Naval Computer and Telecommunications Area Master Stations, Maritime Operations Centers, and Intelligence Commands.

<sup>51</sup>COMUSFLTFORCOMINST 4790.3.

<sup>52</sup>[GAO-21-366](#) and [GAO-24-106819](#).

and level of training that are needed to execute the maintenance consistently and expertly aboard ship.

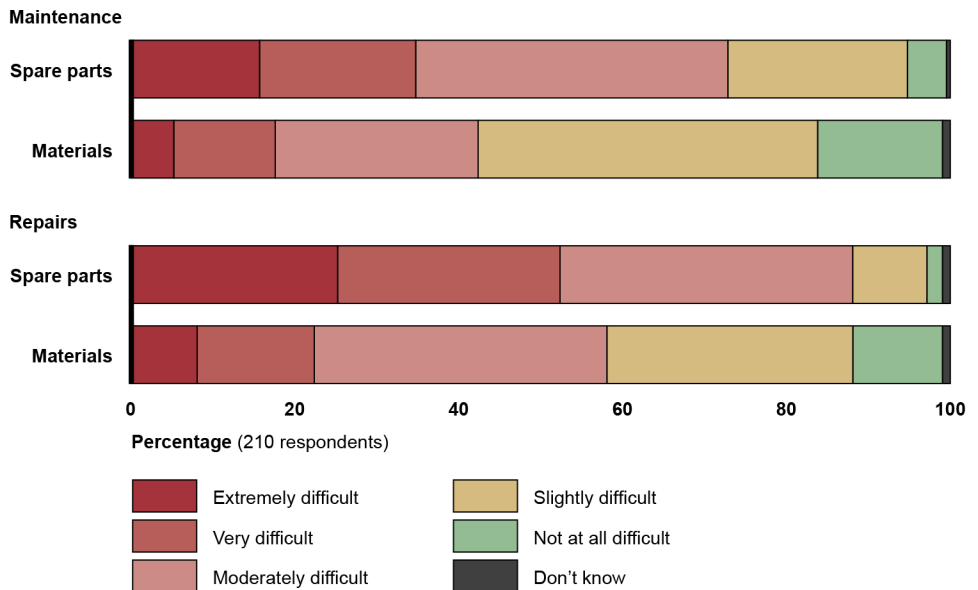
## The Navy’s Persistent Shortages of Parts and Materials Hamper Sailor-Led Maintenance

Navy officers and sailors reported to us that they find it difficult to complete sailor-led maintenance and repairs due to persistent shortages of parts and materials. The Navy did not meet its goal of supplying 65 percent of requested items through the spare part inventory aboard a ship during fiscal year 2017 through fiscal year 2022. This has occurred in part due to spare parts inventory lists not being kept up to date, resulting in outdated information. In addition, these lists may be inaccurate because the Navy may not be using the right models to establish the requirements for spare parts.

## Navy Executive Officers and Sailors Reported That a Lack of Parts and Materials Are an Impediment to Ship Maintenance

First, Navy executive officers who completed our survey on behalf of their ships stated that they find it moderately to extremely difficult to complete sailor-led maintenance and repairs with the parts and materials available on the ship (see fig. 10).

**Figure 10: Ship Survey Responses About the Difficulty of Completing Sailor-Led Maintenance and Repairs with Spare Parts and Materials Available**



Source: GAO analysis of survey results. | GAO-24-106525

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Of the executive officers who completed our survey on behalf of their ships regarding sailor-led maintenance:

- With the spare parts available, 73 percent said it was moderately to extremely difficult to complete sailor-led maintenance; and
- With the materials available, 42 percent said it was moderately to extremely difficult to complete sailor-led maintenance.

Of the executive officers who completed our survey on behalf of their ships regarding sailor-led repairs:

- With the spare parts available, 88 percent said it was moderately to extremely difficult to complete sailor-led repairs; and
- With the materials available, 58 percent said it was moderately to extremely difficult to complete sailor-led repairs.

Second, in discussion groups aboard each of the 25 ships we visited, sailors consistently cited parts shortages as an impediment to their ability to perform maintenance and repairs. They also cited various steps that they have taken in efforts to complete tasks, such as taking parts from other ships, buying parts while in port, and reverse engineering parts.

The Navy often takes parts and materials from one ship to use on another ship—referred to as cannibalizations—to obtain parts and materials that are not available in the supply system. For example, some cannibalizations may be driven by parts that are older and no longer being produced by manufacturers, so they are hard to obtain.<sup>53</sup>

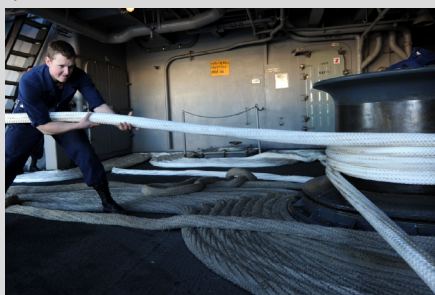
Sailors aboard a submarine we visited provided a list of 222 items removed from the submarine during a maintenance cycle and given to 17 other submarines to enable those ships to continue operations. The sailors aboard that same submarine also identified 46 additional parts from their submarine that were designated for use by other ships. These items included antennae, circuit card assemblies, gears, pumps, valves, indicator lights, an electric control panel, and computers.

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<sup>53</sup>GAO, *Weapon Systems Sustainment: Navy Ship Usage Has Decreased as Challenges and Costs Have Increased*, [GAO-23-106440](#) (Washington, D.C.: Jan. 31, 2023).

### Sailors Are Often Resourceful When Completing Maintenance and Repairs

Sometimes sailors devise solutions to complete maintenance and repairs aboard ships by necessity. For example, sailors on a ship we visited did not have a part needed to keep a gun turret operational. They cannibalized a motor from a capstan—a non-combat system that rotates to assist sailors tying their ship to the pier—and used it on a gun turret. This action allowed sailors to repair a weapon system critical to effective operations.



A capstan helps sailors tie the ship to the pier.



A 5-inch gun on a rotating turret is fired.

Source: GAO. Photo Sources: Capstan-U.S. Navy photo by Kenneth Abbate aboard USS Stennis (CVN-74); 5-inch gun-U.S. Navy photo by Ryre Aciaga aboard USS Millius (DDG 69). | GAO-24-106525

We have reported that the practice of taking parts from one ship to use on another ship can help ensure the receiving ship meets operational requirements. However, this practice may result in additional costs associated with the maintenance hours needed to remove a part or subassembly from one ship and installing it on another ship. In addition, a cannibalized part may need additional inspection, testing, or maintenance before it can be re-used.<sup>54</sup>

Sailors told us that when moving parts from one ship to another, they also risk breaking functioning parts, and incurring time and expense to repair them. They also showed us that they sometimes use cannibalizations to maintain operational capability in innovative ways. For example, we observed sailors keep a combat system running by removing a motor from a non-combat system and installing it on a gun mount aboard ship (see sidebar). Further, sailors sometimes reverse engineer parts to complete repairs. For example, we observed sailors in a shop aboard an aircraft carrier reverse-engineering an electric motor to provide support for a smaller ship.

Navy officers and sailors on ships that we visited said that they sometimes found it necessary to purchase parts and materials for their ship locally. For example, sailors on one ship discussed the need to purchase interior door handles from a local hardware store. We have reported that local procurement may increase costs as the part or item may cost more when procured as part of a smaller buy, as the purchaser may not benefit from economies of scale.<sup>55</sup>

DOD and the Navy have several approaches to addressing shortages in parts and materials aboard Navy ships, but officers from some ships we visited stated that it is important, given the limited space available aboard a ship, that the lists of parts and materials are updated and accurate. The fleet's readiness depends on the right repair parts, technical manuals and special tools being available when the operator or maintenance personnel need them.

<sup>54</sup>GAO, *Defense Inventory: Further Analysis and Enhanced Metrics Could Improve Service Supply and Depot Operations*, [GAO-16-450](#) (Washington, D.C.: June 9, 2016).

<sup>55</sup>[GAO-16-450](#).

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## The Navy Did Not Meet Its Goal for Supplying Items Necessary for Sailor-Led Maintenance

The Navy did not meet its goal of supplying 65 percent of requested items—parts and materials—aboard ships, according to our analysis of Navy data from fiscal year 2017 through fiscal year 2022. Specifically, the Navy established a supply target that a Navy ship should have 65 percent of items onboard when requested as part of its COSAL.<sup>56</sup>

We analyzed Navy data on the ships in the active battle fleet to find out how many ships met the supply target of having 65 percent of requested items onboard.<sup>57</sup> We found that during fiscal year 2017 through fiscal year 2022, on average:

- Of the Navy ships in the active battle fleet, 6 percent met the Navy's supply target of having 65 percent of requested items on board when needed.
- Overall, the ships in the active battle fleet had about 50 percent of requested parts and materials onboard when needed.<sup>58</sup>

The Navy uses the COSAL to reflect the most current equipment aboard each ship and allow for effective supply actions.<sup>59</sup> The Navy's shipboard

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<sup>56</sup>The Navy refers to this as a gross effectiveness target for its shipboard allowance list which expresses how often items, such as parts and materials for sailor-led maintenance, should be onboard a ship when requested. Gross effectiveness targets for certain ship classes may be higher than 65 percent. For example, the target for attack submarines is 70 percent. The Navy provided us with a spreadsheet that included data on all ships that were active during at least part of the period from 2017 through 2022. We calculated the percentage that met the target based on the 232 ships in the scope of our review. We used COSAL gross effectiveness rates in our analysis to avoid considering lead times for supply, which may require sailors to wait days or months for the items requested. Even an accurate COSAL does not guarantee that parts will be on board.

<sup>57</sup>The ability of the Navy to operate for long periods without relying on shore-based logistics communications channels is key to successful operations. For example, Pacific Fleet guidance states that all ships should have 90 days of material to be maintained on hand to sustain current operations. Commander Pacific Fleet (COMPACFLT) Appendix 13 to Annex D to COMPACFLT Operations Order (OPORD) 201-18, *Material Support* (Mar. 31, 2018).

<sup>58</sup>For attack submarines and submarine tenders, the supply target is having 75 percent of requested items on board when needed. TYCOMS are authorized to specify higher supply targets after obtaining approval from Navy's Mobility and Combat Logistics Division, through the chain of command.

<sup>59</sup>The COSAL is a consolidated listing of the equipment, components, repair parts, consumables and operating space items required for an individual ship to perform its operational mission. According to Navy guidance, Navy Supply Systems Command will maintain a database holding the current authorized retail allowance, by stock number, for all surface ships, submarines, aircraft carriers and shore stations. OPNAVINST 4441.12E, *Retail Supply Support of Naval Activities and Operating Forces* (Mar. 14, 2022).

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allowance lists are supposed to be updated when equipment is added or removed, such as at the end of every depot maintenance period, or when new equipment, parts, and technical manuals are ordered.<sup>60</sup> Maintenance activities submit COSAL changes to a data manager that provides updates to Naval Supply Systems Command (NAVSUP) every two weeks, along with appropriate updates to the fleet every other month, according to a Navy official.

We examined the possibility that the Navy may be failing to acquire parts and materials onboard ships that match the requirements necessary for sailor-led maintenance due to outdated shipboard allowance data. Specifically, we analyzed whether the Navy was updating shipboard allowance lists after the most recent depot maintenance periods. We requested data on active battle force ships with shipboard allowance lists that had been updated over the past 3 fiscal years (fiscal year 2022 to the first quarter of fiscal year 2024 at the time of our review). We received data from the office of the Deputy Chief of Naval Operations for Fleet Readiness and Logistics on 115 ships.<sup>61</sup> When we compared the dates of update with the dates that their most recent depot maintenance period ended, we found that most of these ships may have had outdated shipboard allowance lists. In most cases, the data reflected information that either preceded the most recent depot maintenance period or was updated months after the depot maintenance was finished. In some cases, more than 1 year elapsed between the end of a ship's most recent depot maintenance period and the Navy's update.

Additionally, submarine force officials briefed at a Navy-wide maintenance conference in April 2023 that there was a significant lag between system installation upgrades for a new ship configuration and data reflected onboard the ship in the maintenance management system. According to the briefing, this lag means the onboard configuration does not reflect reality for 1 to 6 months, depending on the system and platform impacted. Units may order the wrong repair parts for their system, which wastes

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<sup>60</sup>NAVSUP P-488.

<sup>61</sup>We received data on 115 of the ships in the active battle fleet and that we included in our survey. We also received data on an additional 24 support and logistics ships. However, these ships were outside our scope, and we did not compare allowance list updates to depot maintenance periods for these ships. Two of these ships had been part of the active battle fleet at the time we conducted our survey but were decommissioned later in 2023.



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man-hours to find the right part, and occasionally results in a cannibalization.

According to NAVSUP officials, they regularly send updates to each ship but cannot guarantee that the ship's crew have incorporated the information into shipboard allowance lists. Officials also described procedures for updating the shipboard allowance list, but said implementation depends on whether ships, intermediate maintenance activities, and shipyards provide timely updates to the configuration data manager for each ship class. The Naval Sea Systems Command oversees this part of the process.<sup>62</sup>

If sailors discover items on their shipboard allowance list that are inaccurate or outdated, they can submit a feedback report to request an allowance update.<sup>63</sup> However, sailors during our ship visits told us that the shipboard allowance update process takes more time than desired and that they sometimes received no response confirming changes are made. Navy officials confirmed that feedback reports were sometimes sent to email addresses belonging to individuals who were no longer responsible for processing them. They also said that historically, configuration data managers work on a backlog which at times could potentially delay an update for up to 12 or more months.

Navy maintenance policy states that maintaining current, accurate records for all installed ship systems and variants is critical to ensuring proper resourcing to ensure continued and sustained readiness.<sup>64</sup> Moreover, Navy guidance states that it is essential that changes be incorporated promptly and properly upon receipt, and that corrective action be taken when it is determined that any part of the shipboard allowance list is inaccurate or incomplete.<sup>65</sup> The Deputy Chief of Naval Operations for Fleet Readiness and Logistics serves as the resource sponsor for operational logistics and supply chain support, including determining requirements, and allocating resources to provide suitable

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<sup>62</sup>NAVSEAINST 4790.8D.

<sup>63</sup>NAVSUP P-488.

<sup>64</sup>OPNAVINST 4700.7M.

<sup>65</sup>NAVSUP P-488. The officials referenced in the sentence are from the offices of the Deputy Assistant Secretary of the Navy for Sustainment, Deputy Chief of Naval Operations for Fleet Readiness and Logistics, Naval Sea Systems Command, and Naval Supply Systems Command.

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logistics support in the areas of supply and distribution, among other responsibilities.<sup>66</sup>

NAVSUP's Allowance and Configuration Management Division is responsible for publishing the shipboard allowance lists and maintaining the highest level of quality for the data published or released in data set formats, and the Naval Sea Systems Command is responsible for overseeing some recurrent updates.<sup>67</sup> However, the Navy has not ensured that shipboard allowance lists are updated and accurate. NAVSUP officials acknowledged that they cannot guarantee that update information they provide will be incorporated into ship documentation. Until the Navy ensures that shipboard allowance lists are updated and accurate, ships will continue to carry items they no longer need, at the expense of items that they do need.

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### Shipboard Allowance Lists Do Not Always Accurately Reflect Requirements for Spare Parts

Shipboard allowance lists do not always accurately reflect requirements for spare parts. The Navy develops requirements for both shipboard and shore repair parts allowances during each program's acquisition phase.<sup>68</sup> However, initial requirements may understate what ships need in order to be self-sufficient during extended periods at sea if they are not developed using a process known as readiness-based sparing, according to Navy officials.<sup>69</sup> The requirements are also not always updated regularly to incorporate such new information as observed failure rates of equipment.

To help ensure program offices are updating the projected need for spare parts based on real world experience, DOD and Navy guidance both require the use of readiness-based sparing in certain circumstances. DOD guidance states that DOD components will use readiness-based sparing methods, where feasible, to determine the inventory investment

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<sup>66</sup>OPNAVINST 5450.352B, *Missions, Functions, and Tasks of the Office of the Chief of Naval Operations* (Mar. 9, 2022).

<sup>67</sup>NAVSUP P-488.

<sup>68</sup>We reported in 2020 that ship designs did not effectively consider maintainability, and that untested sustainment assumptions turned out to be incorrect after ships were delivered to the fleet. See GAO, *Navy Shipbuilding: Increasing Focus on Sustainment Early in the Acquisition Process Could Save Billions*, [GAO-20-2](#) (Washington, D.C.: Mar. 24, 2020).

<sup>69</sup>Readiness-based sparing (RBS) is a process used to determine range, depth, and location of spare parts to support required readiness objectives at the least cost given the reliability and maintainability characteristics of a system or equipment. RBS techniques are applied for all new non-nuclear and non-Fleet Ballistic Missile major systems. An optimal sparing methodology is implemented using RBS. NAVSUP P-488.

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required for the fielding of a new weapon system.<sup>70</sup> According to Navy guidance, the Deputy Chief of Naval Operations for Fleet Readiness and Logistics is responsible for overseeing, assessing, and updating readiness-based sparing policy.<sup>71</sup> Further, Navy guidance states that program offices should use readiness-based sparing methods for certain new acquisition programs, and to the maximum extent for other systems.<sup>72</sup> Additional guidance notes that readiness-based sparing will be selectively employed where it provides an optimal method for attaining readiness.<sup>73</sup> Navy guidance also allows other models to be used instead of readiness-based sparing models.<sup>74</sup> For example, the Navy can determine supply support necessary for certain spare parts (such as low-cost or non-critical parts) using a demand-based model.

Using the right models to generate shipboard allowance lists is important for having parts and materials on hand for maintenance and repairs. For example, the Navy recently applied an updated readiness-based sparing model to the SLQ-32, an electronic warfare system. In 2017, the Navy had established the need for 22 spares, but using the model to include usage and failure rates in 2023, it increased the requirement to 46 spares. Thus, if the ship stocked 22 parts based on an obsolete allowance list, it would have less than half of its required allowance for spare parts and its shipboard allowance lists would not accurately reflect requirements.

However, officials stated that there is a lack of clarity about when and under what circumstances to apply readiness-based sparing models, in part because the perceived cost of applying the models. Specifically, resource sponsors may have to purchase parts and materials generated by the model to match updated requirements. Navy officials acknowledge that accurately identifying parts requirements is a prerequisite for supply chain management actions that may help to resolve parts and materials shortages and improve readiness. Until the Navy clarifies its guidance to specify how and when program offices must use readiness-based

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<sup>70</sup>DOD Manual (DODM) 4140.01, vol. 2, *DOD Supply Chain Materiel Management Procedures: Demand and Supply Planning*, (Nov. 9, 2018).

<sup>71</sup>OPNAVINST 4442.5B, *Readiness Based Sparing* (Nov. 17, 2022).

<sup>72</sup>DOD Manual 4140.01.

<sup>73</sup>NAVSEA Manual, *Provisioning, Allowance and Fitting Out Support (PAFOS)* (2024).

<sup>74</sup>NAVSUP P-488.

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sparing, it risks not having an accurate basis on which to determine spare parts requirements.

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## The Navy Is Working to Improve Management of Sailor-Led Maintenance, but Old and Fragmented Systems Hinder Efforts

### The Navy Revised Its Management Processes and Metrics for Sailor-Led Maintenance

The Navy has revised its management processes and metrics for sailor-led maintenance to increase performance and visibility into actual results. In 2022, the Navy began the *Get Real Get Better* initiative to encourage honest self-assessment and taking actions to fix problems sooner rather than later. As part of that effort, the Navy is seeking to improve outcome-oriented performance metrics, data-driven methodologies, and maintenance process improvements, according to Navy documents. For example, according to the Navy's Board of Inspection and Survey it is taking steps to meet the requirement of all ships being inspected every 3 years, rather than the current average of approximately 4.5 years.

In addition, in fiscal year 2022, the Navy revised its material readiness assessment scoring to align more closely with statutory requirements.<sup>75</sup> The updated metrics range from a score of 0.0, or totally inoperative, to 1.0, or fully operative. According to the Navy Board of Inspection and Survey's March 2023 report, the updated calculation weights scores for functional areas (e.g., aviation, weapons, and main propulsion) based on their importance to the platform's primary missions with respect to lethality and/or survivability.<sup>76</sup> The functional area scores are averaged to

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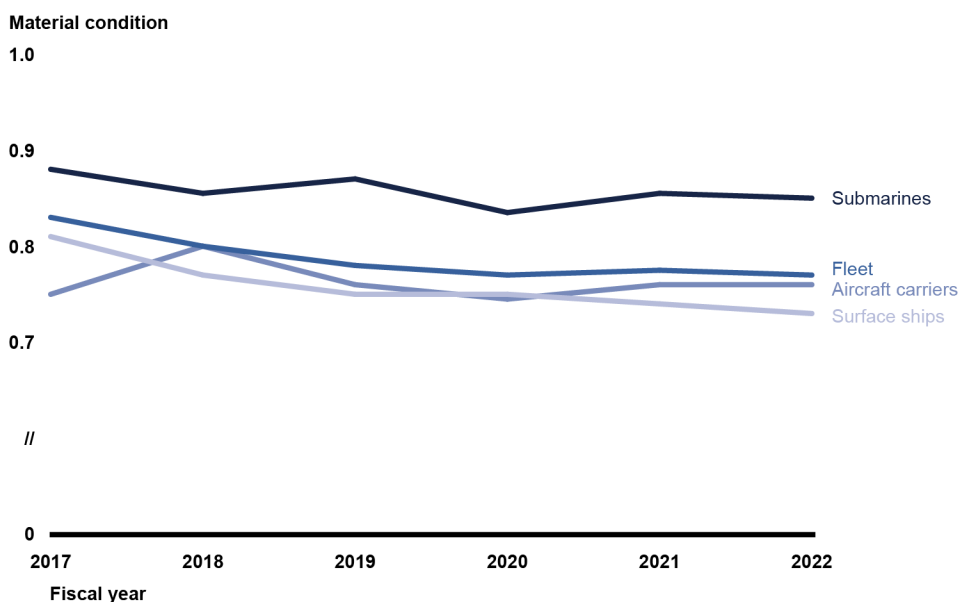
<sup>75</sup>Not later than March 1<sup>st</sup> of each year, the Navy's Board of Inspection and Survey is required to report to the congressional defense committees on the material readiness of Navy ships as compared to established material requirements standards; the overall number and types of vessels inspected during the preceding fiscal year; and for in-service vessels, material readiness trends by inspected functional area as compared to the previous five years. 10 U.S.C. § 8674.

<sup>76</sup>Navy Board of Inspection and Survey, *INSURV Annual Report* (March 1, 2023).

form an overall score and can be used to assess both mission capability as well as the relative material readiness of a particular ship when compared to scores from other ships in its class.

The updated metrics show that overall fleet material condition declined slightly in fiscal year 2022, resuming a slight but steady negative trend since fiscal year 2017. Specifically, the condition of ships and submarines continued to decline during fiscal year 2017 through fiscal year 2022, and the condition of aircraft carriers declined slightly since fiscal year 2021 (see fig. 11).<sup>77</sup>

**Figure 11: Ship Condition for Fiscal Year 2017 through Fiscal Year 2022**



Source: GAO analysis of Navy data. | GAO-24-106525

Most Navy officials responding to our survey of the active battle fleet said they were generally satisfied with the metrics used by the Navy to measure ship conditions and readiness. Specifically, 25 percent were slightly satisfied, and 46 percent reported that they were moderately to extremely satisfied with the metrics used to measure the effectiveness of

<sup>77</sup>The negative trend is more notable due to updated calculations that reflect ship material condition assessment scoring to adhere to standards in COMUSFLTFORINST 4790.3, vol. VI, chap. 5, app. A. JFMM-compliant scoring began in fiscal year 2021, and previous year's scores were mathematically adjusted to match the current scoring schema by Inspection and Survey and Naval Surface Weapon Center Corona data scientists.

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**Selected Quotes from Navy Officers Regarding the Effectiveness of Navy Maintenance Metrics**

"I have little faith that higher echelons understand or do anything to help correct shipboard issues, nor do they use the right metrics to assess if a ship is documenting their issues correctly."

"Navy efforts to determine maintenance effectiveness is lacking in many respects. There doesn't seem to be a one-size fits all metric that accounts for the ship schedule and circumstances."

"Metric scores are used to penalize the ship, but do not take into account the quantity of repairs made. Rather than provide extra resources (manpower, maintenance assistance) to ships with low scores, it seems ships are incentivized to artificially manipulate work items to improve scores."

Source: GAO selections from survey responses and interviews with ships' crews. | GAO-24-106525

sailor-led maintenance. However, about 26 percent of Navy officials who responded to our survey reported they were not at all satisfied with the metrics used to measure the effectiveness of sailor-led maintenance. Some officers responding to our survey felt the Navy's systems were a hindrance to effective performance (see sidebar).

The Navy is in the process of making additional improvements to performance metrics and ensuring that officers are aware of the tools at their disposal for identifying cause and effect relationships impacting the ability of their crews to complete sailor-led maintenance. For example, the Navy's Performance to Plan initiative is being promoted as an engine to help Navy officers "Get Real, Get Better," including the use of data to identify cause-and-effect relationships of drivers to outcome metrics, developing a baseline of historical trends and current performance, and developing a forward-looking view of performance to improve future trends. According to the Navy, every sailor, from deckplate maintainers to flag officers, will benefit from the discipline and rigor of this initiative.

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**The Navy Uses Old and Fragmented Information Technology Systems to Manage Sailor-Led Maintenance and Has Not Successfully Fielded Planned Improvements**

Navy commands—including ships, submarines, and naval shipyards—use old and fragmented information technology (IT) systems to manage sailor-led maintenance. The Navy is working to consolidate sailor-led maintenance systems but plans to take at least until 2030 to field them across the fleet due to delays in implementation. While the Navy has a plan, it has not effectively shared its vision and received feedback from all stakeholders to ensure its course of action will improve the effectiveness and efficiency of sailor-led ship maintenance, according to officials.

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## Navy Uses Old and Fragmented IT Systems to Manage Sailor-Led Maintenance

### Selected Quotes from Officers Regarding the Effectiveness of Navy Maintenance IT Systems

"Ship's crew is overwhelmed with the admin burden for maintenance, making it more challenging to complete. When they do have access to computers, often the internet speeds or cyber protocols make it difficult to access tools."

"Currently, to do preventive maintenance and any follow-on actions, our Sailors may have to work with several separate computer programs with zero integration - each maintaining a unique and un-linked database of information that must be manually validated and updated by ship's force."

"The system used to document and communicate required repairs, seems to not be ready for use. It does not replicate effectively off ship, causing additional man-hours to be expended by ship's force and the port engineer ashore. With limited manning, systems need to work as intended."

"The two largest barriers to effective shipboard maintenance are a) Inefficient and ineffective maintenance management tools. and b) poor parts availability complicated by a labyrinthine logistics support system."

Source: GAO selections from survey responses. | GAO-24-106525

The Navy uses a variety of old and fragmented IT systems and networks to manage sailor-led maintenance and repairs, according to Navy documents and our observations. Obsolete IT, excessive administration and cumbersome work practices hamper Naval Operating Forces' ability to maintain material readiness, according to officers responding to our survey and Navy officials (see sidebar). Ships, port engineers, and project managers all use different databases for planning and managing maintenance, according to Navy officials. Navy leaders spend an inordinate amount of time trying to plan maintenance, track the completion of work, and eliminate inaccurate or duplicate data, according to Navy officials. Using multiple systems to track the same information has undermined sailors' ability to complete maintenance and increased administrative burdens, according to our survey and shipboard observations.

For example, according to our analysis:

- Sailors use at least six different IT systems to plan work, order parts, and record completion of work for maintenance and repairs, according to Navy officers and officials. Specifically, sailors use three different IT systems for preventive maintenance; two different IT systems for corrective maintenance; and the Navy R-Supply system or Defense Logistics Agency systems for ordering parts and materials.<sup>78</sup> Sailors also use a variety of additional software applications to report maintenance problems. Some of these problems are significant enough to imperil the ship's ability to complete its mission. In others, sailors could not complete maintenance as required and need a waiver to be allowed to get underway.<sup>79</sup>

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<sup>78</sup>R-Supply provides online inventory, logistics, and financial management tools. The application provides access to supply functions, including ordering, receiving and issuing necessary supplies and material; maintaining financial records; and reconciling supply, inventory and financial records with the shore infrastructure. NAVSUP P-732, *R-Supply Unit User's Guide* (Mar. 31, 2005). DLA is responsible for contracting, purchasing, storing and distributing most of the consumable, expendable and repairable items for DOD. Its primary purpose is to meet the logistics requirements of the armed forces for food, clothing, fuel, repair parts and other items.

<sup>79</sup>Navy guidance requires compliance with maintenance technical specifications but allows departures from specifications if approved by the proper authority. OPNAVINST 4700.7M. The Navy uses an *Electronic Departure from Specification* (eDFS) module for processing reported deficiencies. For more information see [GAO-22-104510](#).

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- In 2001, the Navy began to use one software application, the Organizational Maintenance Management System–Next Generation (OMMS–NG) to document and report shipboard material deficiencies. The Navy uses a separate planned maintenance scheduling software (SKED), to schedule preventative maintenance tasks. Until about 2011, the Navy was able to use SKED to pass parts information to OMMS-NG and automatically order parts, according to officials. However, they added that the two applications are not hosted on the same platform, and competing priorities among resource managers eliminated funding for data-sharing features in 2011—a move that Navy leadership in 2021 characterized as “mismanaged”.<sup>80</sup> As a result, for more than a decade, sailors conducting maintenance have had to make multiple manual data entries across separate systems to order parts, increasing their administrative burden.
  - Just as the Navy stopped funding the interface between OMMS-NG and SKED, the Navy began to deploy an application to replace OMMS-NG (known as Automated Work Notification), according to officials. But the Navy did not deploy the Automated Work Notification system to all ships. As a result, some ships (largely on the West Coast) continue to use OMMS-NG, while others use the Automated Work Notification system. In addition, sailors we met with expressed frustration that OMMS or Automated Work Notification systems sometimes drop work orders. As a result, port engineers and others may believe a job has been completed and parts are no longer needed, even though sailors are still waiting for their parts order to be filled, according to analysts at Pacific Fleet Command.
  - We met with submarine officers during our site visits who, in the absence of reliable software and connectivity, have resorted to recording and tracking maintenance actions using pen-and-paper ship logbooks. These officers indicated that this practice is widespread across the submarine fleet. Navy officials confirmed that this practice is a standard for the submarine community and provides a reliable—albeit labor-intensive—back-up for aging information systems.
  - Port engineers and project managers use shore-based infrastructure and information systems. Thus, sailors who change duty stations must relearn maintenance processes and management information

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<sup>80</sup>According to the Director, Fleet Maintenance at Fleet Forces Command, the capability to automatically pass parts information between systems was functioning and in use by sailors in 2001. Problems arose when the automated process was not resourced, and the supporting interfaces were shut down around 2011.



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systems, depending on their location (ship or shore duty, West or East Coast, or forward deployed), according to Navy officials.

An undisciplined approach to management (IT) system acquisitions has increased administrative burdens for sailor-led maintenance, according to Navy officials. In 2012 the Commander, Fleet Forces Command said that it would take a long and steady commitment to reverse the damage caused by years of undisciplined software management in the fleet. Competing priorities among program offices, resource sponsors, and others has resulted in important capabilities being mismanaged or abandoned entirely, despite investments made to have them fielded and in use in the fleet, according to Navy officials. By 2021, the Commander for Fleet Maintenance of Fleet Forces Command stated the scale and urgency of the problem had become clear, and that bold action is needed to consolidate information technology using an enterprise-wide approach.

#### Navy Plans to Consolidate Sailor-Led Maintenance Systems

In 2020, the Navy combined ongoing efforts into the N-MRO program to address these problems and replace legacy maintenance IT systems with a single, user-friendly, application to improve sailor-led maintenance management, according to a Fleet Forces Command official. This integrated system is planned to be available in 2030. In addition, the Navy presented a goal at the March 2023 Navy-wide 3M Summit to reduce the administrative burden on sailors to complete maintenance and repairs by as much as 80 percent. Adopting N-MRO as a single user-friendly application will harmonize processes Navy-wide; eliminate the administrative burden of manually aligning separate systems; improve accountability among maintenance personnel; and support data-driven decision-making, according to Navy officials. Furthermore, adopting a single-user friendly application Navy-wide will reduce the need for personnel to learn new maintenance software each time their ship's location (at sea, pier-side, or in the shipyard) changes, according to Navy officials.

Successful deployment of enterprise-wide, cloud-based services will require improvements to software, global data integration and connectivity, and improvements at transmission sites, according to Navy documents. Navy plans for leveraging cloud-based services will also require the ability to increase bandwidth and transmit signals to mobile devices aboard and within Navy ships and submarines at sea, according to Navy documents and officials.

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Schedule Delays and Other Challenges Hamper Implementation of N-MRO Software and Supporting Infrastructure

The Navy has faced schedule delays that have hampered its deployment of N-MRO software as well as the software's supporting infrastructure. In 2021, the Navy planned to deploy N-MRO to all Navy activities by fiscal year 2026.<sup>81</sup> According to Navy documents, this would result in all Navy maintenance logistics IT being aligned to a coordinated effort. However, due to challenges in rolling out the program, in 2023 the Navy revised its schedule. As of March 2024, the Navy planned to implement N-MRO Navy-wide by the end of fiscal year 2030. The Navy had also planned to deploy N-MRO to a single test ship in July 2023, but did not do so until February 2024. The Navy plans to add additional ships from different classes but has delayed that schedule as well.

In addition, the Navy has been challenged to acquire hardware and expand infrastructure support for cloud-based services at shore based-facilities and aboard ships. For example, as of the Navy-wide N-MRO conference in November 2023, officials said that the Navy had not committed to acquiring reliable, affordable mobile devices, such as tablets, for using logistics IT applications such as N-MRO aboard ships. It also had not determined how to secure resources for deploying mobile devices Navy-wide. In addition, the infrastructure necessary to support the transmission of signals to carry cloud services was not adequate, nor was the number of personnel to maintain the infrastructure to meet bandwidth demands. The Navy also needs wireless routers and shipboard IT technology to ensure that N-MRO works for sailors aboard ship, according to Navy officials. Navy officials acknowledge the cost of tablets and peripherals may need to be updated and that they need to determine the cost of installing wireless routers and server banks to support N-MRO and other logistics IT improvements. Effective coordination among stakeholders and resource sponsors is necessary to meet the needs of end users to improve connectivity hardware aboard ships using wireless routers and shore-based servers, according to Navy officials.<sup>82</sup>

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<sup>81</sup>The Navy also plans to deploy N-MRO to Naval aviation maintenance sites.

<sup>82</sup>We previously reported that cloud computing is a means for enabling on-demand access to shared pools of configurable computing resources (e.g., networks, servers, storage applications, and services) that can be rapidly provisioned. In addition, agencies can use pooled resources for cloud services, including storage, processing, memory, and network bandwidth. GAO, *Cloud Computing: Agencies Have Increased Usage and Realized Benefits, But Cost and Savings Data Need to be Better Tracked*, [GAO-19-58](#) (Washington, D.C.: Apr. 4, 2019).

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The Navy Did Not Effectively Share Its Vision or Receive Feedback to Determine if Deploying N-MRO Is Likely to Meet Stakeholder Needs

The Navy's vision of deploying N-MRO with a single, user-friendly application will rely on the support of stakeholders Navy-wide. Specifically, deploying N-MRO will require harmonizing processes as part of the broader logistics IT improvement initiative. Doing so will affect many stakeholders, including shipboard personnel, personnel at regional maintenance centers, and Navy shipyards, according to Navy documents and Navy officials.

Input from Navy stakeholders may impact capacity requirements for shared bandwidth, memory on servers and end-user devices such as tablets, and wireless network signals at shore installations and aboard ships and submarines in the fleet, according to Navy officials. However, participants at the November 2023 N-MRO conference stated that overall awareness of N-MRO is lacking Navy-wide. As a result, other Navy entities that recognize the need for modern maintenance processes began developing their own initiatives. For example, a Navy Sea Systems Command official briefed that a Naval shipyard was developing logistics IT improvements separately from N-MRO. In addition, Navy officials discovered a separate logistics IT initiative developed for naval aviation in a manner that duplicated aspects of the N-MRO, even though the Naval aviation community is participating in the N-MRO development process, according to Navy officials.

Further, key stakeholders—including Regional Maintenance Centers and Naval Shipyards—were not participating in N-MRO development until fall 2023, according to our observations at a Navy-wide N-MRO conference. Regional Maintenance Centers and Naval Shipyards may require modifications to applications used for sailor-led maintenance, according to Navy officials. Finally, Navy officials have acknowledged that they might not be aware of additional efforts within the Navy that potentially duplicate logistics IT improvement efforts described above and associated with N-MRO and other initiatives to improve sailor-led maintenance.

According to the Project Management Institute (PMI), programs should engage stakeholders proactively and to the degree needed to contribute to project success and customer satisfaction.<sup>83</sup> Further, stakeholder

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<sup>83</sup>Project Management Institute, Inc., *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh Edition (2021)*. PMBOK is a trademark of Project Management Institute, Inc. The Project Management Institute is a not-for-profit association that, among other things, provides standards for managing various aspects of projects, programs, and portfolios.

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engagement is critical to enhancing program or project success. This includes, among other things, assessing and addressing stakeholder resistance and clarifying the understanding among various groups of stakeholders about their roles in attaining program goals.<sup>84</sup> In addition, *Standards for Internal Control in the Federal Government* state that management should internally communicate the necessary quality information to achieve the entity's objectives.<sup>85</sup> Specifically, management should communicate quality information throughout the entity using established reporting lines—down, across, up, and around reporting lines to all levels of the entity. In addition, management should receive quality information about the entity's operational processes that flows up the reporting lines from personnel to help management achieve the entity's objectives. Communicating quality information may enable personnel to perform key roles in achieving objectives, addressing risks, and supporting the internal control system. In these communications, management assigns the internal control responsibilities for key roles.

However, the Navy has not effectively engaged stakeholders proactively and to the degree needed to contribute to project success and customer satisfaction. Specifically, the program executive office for N-MRO has not established a mechanism for management to periodically communicate quality information throughout the Navy to:

- ensure that internal stakeholders—especially potential users of N-MRO such as users of legacy systems—fully understand the program's purpose and applicability to their organizations; and
- successfully enlist users in solving remaining challenges, according to Navy officials and our observations.

Officials at Fleet Forces Command and the Program Executive Office for Manpower, Logistics, and Business Solutions acknowledged that stakeholders did not fully understand the purpose of the program or schedule for expansion to all ships and submarines along with supporting

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<sup>84</sup>Project Management Institute Inc., *The Standard for Organizational Project Management* (2018). Because program management involves the delivery of new capabilities and required transition activities, programs often encounter complex challenges that include resource limitations, technical challenges, and resistance to change. As an example, a shortfall in resources can limit the scope of capabilities delivered by the component projects, which may in turn limit the full realization of planned benefits. Further, if resistance to change arises, the new capabilities may not be adopted or may not be sustained, which reduces the value of implementing them.

<sup>85</sup>[GAO-14-704G](#).

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shore installations such as shipyards. Officials at the N-MRO conference recognized the need to communicate more effectively.

Unless the Navy establishes a mechanism to provide quality information about N-MRO deployment Navy-wide, including a way to ensure that stakeholder concerns are sought out and addressed, the Navy may fail to obtain full participation from key stakeholders. Moreover, not establishing such a mechanism is likely to impede progress toward a solution that reflects the needs of end users and may further lengthen the deployment schedule. If the Navy does not deploy N-MRO and other cloud-based applications more rapidly, it also risks introducing an additional IT system to an already fragmented operations environment for sailor-led maintenance rather than harmonizing processes as intended.

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## Conclusions

The Navy must have well-maintained, combat-ready surface ships, aircraft carriers, and submarines available to fulfill its role in keeping the U.S. safe and the seas open to trade and world commerce. Sailors perform maintenance and repairs aboard ships at sea or in port to help achieve these goals. However, the Navy faces interrelated personnel and training challenges that hinder its ability to complete required maintenance. Updating Navy policy to require that the Navy periodically gather and report personnel data specific to sailor-led maintenance, such as comparing assigned personnel to the number of mustering personnel available for duty and tracking the quality of sailors' alignment across departments, could improve the Navy's oversight and ability to accurately report readiness data. Such information, if gathered and reported at regular intervals, could also enable the Navy to improve its quarterly or semi-annual readiness reporting to Congress. Moreover, the Navy has shifted away from teaching in-depth and hands-on maintenance and repair techniques. By evaluating and optimizing the balance between classroom and on-the-job training on maintenance skills for junior sailors as it implements Ready Relevant Learning, the Navy could improve sailors' ability to conduct sailor-led maintenance and repairs aboard surface ships, aircraft carriers, and submarines, especially for junior (apprentice) sailors who fill more senior (journeyman) roles.

Additionally, updating policy to include commanding officers as key stakeholders in updating maintenance cards could allow these officers a greater voice about conditions specific to their ship or ship class. Such updates to Navy policy may also help to better reflect the actual time expended in accomplishing sailor-led maintenance tasks in light of specific conditions. Finally, without ensuring that maintenance requirement cards are written at an appropriate level of detail that reflects

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the actual quantity and skill level of maintenance personnel needed to perform repair, the Navy risks having an unrealistic expectation of the numbers and level of training that are needed to execute maintenance aboard ship consistently and expertly.

Persistent challenges with parts and materials shortages can hinder readiness; have negative consequences for critical life-support and combat systems; and diminish ship habitability. Navy program management does not order spare parts and materials to match equipment that is currently aboard a ship because it does not always update shipboard allowance lists or reflect readiness-based sparing models as appropriate. If the Navy ensures that lists of required parts and materials are updated and clarifies its guidance to specify how and when readiness-based sparing must be used, it will be better able to determine the amount and adequacy of parts and materials necessary aboard ships.

Fragmented and disparate processes and IT systems and an undisciplined approach to management system acquisitions and improvements has undermined sailors' ability to complete maintenance and increased administrative burdens. By establishing a mechanism for management to periodically communicate quality information throughout the Navy on the new planned integrated maintenance system, the Navy will enhance stakeholders' understanding of the program's purpose and applicability to their organizations and engage users—including those aboard ships—to assist in solving remaining challenges.

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## Recommendations

We are making 7 recommendations to the Secretary of the Navy.

The Secretary of the Navy should ensure that the Deputy Chief of Naval Operations for Personnel, Manpower, and Training updates Navy policy to require the Navy to periodically gather and report personnel data specific to sailor-led maintenance, such as comparing assigned personnel to the number of mustering personnel available for duty and tracking the quality of sailors' alignment across departments. (Recommendation 1)

The Secretary of the Navy should ensure that the Commander, Naval Education and Training Command, evaluates and optimizes the balance between classroom training and on-the-job training on maintenance skills for junior sailors as it implements Ready Relevant Learning. (Recommendation 2)

The Secretary of the Navy should ensure that policy is updated to include commanding officers as key stakeholders in updating maintenance cards

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to better reflect actual time expended in accomplishing sailor-led maintenance tasks in light of ship-specific conditions. (Recommendation 3)

The Secretary of the Navy, in collaboration with Naval Sea Systems Command, should ensure that maintenance cards are written at an appropriate level of detail to reflect specific conditions affecting the amount of time, number of personnel needed, and training necessary to conduct sailor-led maintenance. (Recommendation 4)

The Secretary of the Navy should direct the Deputy Chief of Naval Operations for Fleet Readiness and Logistics, in collaboration with Naval Supply Systems Command and Naval Sea Systems Command, to ensure that shipboard allowance lists are updated and accurate. (Recommendation 5)

The Secretary of the Navy should ensure that the Deputy Chief of Naval Operations for Fleet Readiness and Logistics, in collaboration with Naval Sea Systems Command and Naval Supply Systems Command, clarifies guidance to specify how and when program offices must use readiness-based sparing. (Recommendation 6)

The Secretary of the Navy should ensure that the Assistant Secretary of the Navy for Research, Development, and Acquisition, in conjunction with the Program Executive Office for Manpower, Logistics, and Business Solutions, establishes a mechanism for management to periodically communicate quality information throughout the Navy to ensure stakeholders fully understand the purpose of the N-MRO program and its applicability to their organizations and successfully enlists users in solving remaining challenges. (Recommendation 7)

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## Agency Comments

We provided a draft of this report to the Navy for review and comment. The Navy provided a response, reproduced in appendix III, and concurred with our seven recommendations.

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We are sending copies of this report to the appropriate congressional committees and the Secretary of the Navy. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>. If you or your staff have any questions about this report, please contact me at (202) 512-9627 or [maurerd@gao.gov](mailto:maurerd@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff that made key contributions to this report are listed in Appendix IV.

A handwritten signature in black ink that reads "Diana Maurer". The signature is written in a cursive, flowing style.

Diana Maurer  
Director  
Defense Capabilities and Management



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# Appendix I: GAO Survey of Executive Officers for Ships in the Active U.S. Navy Battle Fleet

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There were 242 active Navy battle force ships (in commission) in the Navy fleet, including support and auxiliary vessels, as of February 9, 2023, according to the Naval Vessel Registry. We surveyed the surface combatant ships, amphibious warfare ships, aircraft carriers, and submarines that were active as of that date.

We also considered mine countermeasure ships to be within the scope of our review due to their designation as combatants and their forward-deployed status, as well as command ships, which are designed to operate in the open ocean to provide direct support to combatant forces or operations.

We did not include auxiliary ships such as hospital ships in our survey since they are not designated as combatants. We also did not survey Navy support ships such as expeditionary sea bases and submarine tenders, or Military Sealift Command replenishing ships.<sup>1</sup> As a result, the population of ships in our scope that we surveyed is 232.

We obtained responses from the executive officers representing 91 percent of the active battle fleet within the scope of our review and analyzed the results. The terminology used in the survey was pre-tested with selected executive officers and Navy officials and adjusted for presentation in our report using plain language. For example, the Navy term “preventive maintenance” was changed to “maintenance”, and the term “corrective maintenance” was changed to “repairs” for the purposes of our report.

We collected information on, among other things, the extent to which the Navy provides (1) personnel and training, (2) parts and materials, and (3) management processes and systems for completing sailor-led maintenance. Survey respondents were encouraged to consult with other personnel aboard their respective ship who are familiar with the topic, especially if the respondents thought it would help them give a more accurate answer. Furthermore, the survey included text boxes to allow respondents to provide information they felt may be helpful to the issue areas discussed in an open, unrestricted format. For reporting purposes, we adjusted the language to track with survey questions using simpler terminology. For example, in the survey we ask questions about preventive maintenance and corrective maintenance, but in our report, we refer to these as simply maintenance and repairs. In addition, when quoting open format responses from the officers responding to our survey, we paraphrased them to avoid jargon and lengthy complex naval language. See the following pages for a complete copy of the survey.

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<sup>1</sup>Military Sealift Command operates approximately 125 civilian-crewed ships that replenish U.S. Navy ships, conduct specialized missions, strategically preposition combat cargo at sea around the world and move military cargo and supplies used by deployed U.S. forces and coalition partners.



## Survey on Operational Ship Maintenance and Repairs

The U.S. Congress has mandated that the Government Accountability Office (GAO) conduct a review of maintenance and repairs performed by U.S. Navy ships' crew at sea and pier-side (organizational maintenance) in a report accompanying the National Defense Authorization Act for fiscal year 2023.<sup>1</sup>

As part of that review, GAO is conducting a survey of Executive Officers aboard every active aircraft carrier, ship, and submarine in the U.S. Navy. The survey covers topics related to personnel and training, parts and materials, and how the Navy tracks and manages maintenance. Your participation is important, so we urge you to complete the questionnaire.

To assist you in consulting others, we have attached this PDF to the email activating the survey. When responding, please consult with others who are familiar with the topic, especially if you think it will help you give a more accurate answer. When you are ready to complete the web-based version of the survey, please follow the link in the email or use the URL provided in the mail message. Once you have determined likely responses to the questions included in this PDF version of the survey please log in and complete the survey online.

After beginning the survey online, we anticipate it will take 30 minutes to complete. You do not need to complete the survey in one sitting, as the survey will allow you at any point to save your responses and complete the rest later. Please complete the survey at your soonest convenience or by July 24th, 2023.

If you have any concerns, need help in answering the survey, or think you have received this message in error, please contact John E. "Jet" Trubey at [TrubeyJ@gao.gov](mailto:TrubeyJ@gao.gov).

Thank you for your assistance.

We have provided information about GAO (<https://www.gao.gov/>) and our privacy and security policies on our web site (<https://www.gao.gov/surveys>) if you would like more information about our agency or information about how we protect the data from your survey.

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<sup>1</sup>Sailor-Led Maintenance and Repairs, GAO job code 106525

**Appendix I: GAO Survey of Executive Officers  
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**Q1 How difficult is it to complete *preventive* maintenance with the number of crewmembers currently assigned to your ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
While in port	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While underway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q2 How difficult is it to complete *corrective* maintenance with the number of crewmembers currently assigned to your ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
While in port	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While underway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

**Q1 How difficult is it to complete *preventive* maintenance with the number of crewmembers currently assigned to your ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
While in port	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While underway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q2 How difficult is it to complete *corrective* maintenance with the number of crewmembers currently assigned to your ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
While in port	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
While underway	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

**Q3 How useful is the training the Navy currently provides for completing *preventive* maintenance (not to include training provided by your ship's crew)?**

- Not at all useful
- Slightly useful
- Moderately useful
- Very useful
- Extremely useful
- Don't know

**Q4 How difficult is it for the ship's crew to complete *preventive* (periodic or condition-based) maintenance using the training currently provided?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Formal (schoolhouse) training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the job training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

**Q5 How useful is the training the Navy currently provides for completing *corrective* maintenance?**

- Not at all useful
- Slightly useful
- Moderately useful
- Very useful
- Extremely useful
- Don't know

**Q6 How difficult is it for the ship's crew to complete *corrective* (periodic or condition-based) maintenance using the training currently provided?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Formal (schoolhouse) training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On the job training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q7 How difficult is it for the ship's crew to access the Navy's current *on-demand training resources* (not including on-the-job-training from other crewmembers) to support the completion of maintenance?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Preventive maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corrective maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

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**Q8 How useful are the Navy's on-demand training resources (not including on-the-job-training from other crewmembers) to support the completion of maintenance performed by the crew?**

- Not at all useful
- Slightly useful
- Moderately useful
- Very useful
- Extremely useful
- Don't know

**Q9 What additional information would you like to provide to your prior responses?**

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**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

**Q10 How difficult is it for the ship's crew to complete maintenance using the hand tools and equipment currently available aboard ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Preventive maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corrective maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q11 How difficult is for the ship's crew to complete *preventive* maintenance considering the availability of the following items aboard ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Consumable items (e.g., filters, gaskets, lubricants, paints, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equipment (e.g., 3D printers, hazmat gear, lathes, welding gear, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spare parts (e.g., engine components, nuts and bolts, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

**Q12 How difficult is it for the ship's crew to complete *corrective* maintenance considering the availability of the following items aboard ship?**

	Not at all difficult	Slightly difficult	Moderately difficult	Very difficult	Extremely difficult	Don't know
Consumable items (e.g., filters, gaskets, lubricants, paints, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Equipment (e.g., 3D printers, hazmat gear, lathes, welding gear, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spare parts (e.g., engine components, nuts and bolts, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Q13 What methods, procedures, or systems do ship's crew and leadership currently use to track the completion of preventive and corrective maintenance?**

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**Appendix I: GAO Survey of Executive Officers  
for Ships in the Active U.S. Navy Battle Fleet**

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**Q14 How satisfied are you with the metrics used to measure the success of organizational-level maintenance (i.e., maintenance performed by ship's force) in ensuring ship self-sufficiency?**

- Extremely satisfied
- Very satisfied
- Moderately satisfied
- Slightly satisfied
- Not at all satisfied
- Don't know

**Q15 How satisfied are you with the information systems used to track and manage preventive and corrective maintenance?**

- Extremely satisfied
- Very satisfied
- Moderately satisfied
- Slightly satisfied
- Not at all satisfied
- Don't know

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# Appendix II: Objectives, Scope, and Methodology

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House Report No. 117-397, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2023, includes a provision for us to assess the extent to which the Navy has supported sailor-led maintenance and repairs aboard ships.<sup>1</sup> This report evaluates the extent to which the Navy provides (1) personnel and training, (2) parts and materials, and (3) management processes and systems for completing sailor-led maintenance.

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## Methods Used That Support Evaluating All Three of Our Report Objectives

We attended nationwide summits hosted by Fleet Forces Command. These included a Maintenance and Materials Management summit that took place in April 2023, and a conference on the status of Logistics IT updates, including Navy Naval Maintenance Repair and Overhaul, that took place in November 2023. These summits were attended by officers and senior enlisted personnel representing surface ships, submarines and aircraft carriers, personnel from West Coast and East Coast type commands, and key personnel from shore commands supporting ship maintenance and communications.

We conducted a survey of executive officers on all ships, aircraft carriers, and submarines in the Navy battle fleet listed as active by the Naval Vessel Register as of February 9, 2023.<sup>2</sup> We did not include auxiliary vessels managed by Military Sealift Command such as replenishing ships.<sup>3</sup>

We obtained responses from the executive officers representing 91 percent of the active battle fleet ships that we surveyed and analyzed the results. The terminology used in the survey was pre-tested with selected executive officers and Navy officials and adjusted for presentation in our report using plain language. For example, the Navy term “preventive maintenance” was changed to “maintenance”, and the term “corrective maintenance” was changed to “repairs” for the purposes of our report. For a complete version of the survey sent to executive officers representing ships in the active battle fleet see appendix I.

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<sup>1</sup> H.R. Rep. No. 117-397, at 87 (2022).

<sup>2</sup>Secretary of the Navy Instruction (SECNAVINST) 5030.8D, *General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures* (June 28, 2022).

<sup>3</sup>Military Sealift Command operates approximately 125 civilian-crewed ships that replenish U.S. Navy ships, conduct specialized missions, strategically preposition combat cargo at sea around the world and move military cargo and supplies used by deployed U.S. forces and coalition partners.

The scope of our survey included the following ship classes:

- **Ships**

- *Ticonderoga*-class guided missile cruisers (CG-47)
- *Arleigh Burke*-class guided missile destroyers (DDG-51)
- *Zumwalt*-class guided missile destroyers (DDG-1000)
- *Freedom*-class littoral combat ships (LCS-1)
- *Independence*-class littoral combat ships (LCS-2)
- *America*-class amphibious assault ships (LHA-6)
- *Wasp*-class amphibious assault ships (LHD-1)
- *San Antonio*-class amphibious transport docks (LPD-17)
- *Whidbey Island*-class dock landing ship (LSD-47)
- *Avenger*-class mine countermeasures ships (MCM-1)

- **Aircraft carriers**

- *Nimitz*-class aircraft carriers (CVN-68)
- *Gerald R. Ford*-class aircraft carriers (CVN-78)

- **Submarines**

- *Seawolf*-class attack submarines (SSN-21)
- *Los Angeles*-class attack submarines (SSN-688)
- *Virginia*-class attack submarines (SSN-774)
- *Ohio*-class ballistic missile/guided missile submarines (SSBN/SSGN-726)

In addition, we interviewed more than 140 members of ship leadership and conducted discussion groups with more than 200 sailors and observed maintenance aboard 25 ships in the active battle fleet (11 percent of ships within the scope of our review) in the United States and overseas. The ships we visited were selected by identifying fleet concentration areas and coordinating our visits with fleet audit liaisons to identify a variety of vessels likely to be in port during our travel dates. The ships were informed of our visits and directed all available enlisted work center supervisors to meet with us for discussions. We did not allow the presence of officers, senior non-commissioned officers, and tried to avoid having personnel with direct reporting relationships to one another to remain present for discussions. We told ship personnel participating in

discussions with us that their responses would be non-attributable to them as individuals in the interest of a full and frank discussion.

We included quotations from interviews and discussion groups in sidebars to complement text in the report, provide background information, illustrate a point, or call attention to conditions aboard ship. For reporting purposes, when we attribute quotes to officers or enlisted personnel, we adjusted the language used in our report to avoid jargon and reduce complexity as appropriate. Specifically, we visited ships homeported and located in Norfolk, Virginia; San Diego and Point Loma, California; Bangor, Bremerton, and Everett, Washington; Yokosuka and Sasebo, Japan; and Pearl Harbor, Hawaii. During these ship visits, we asked officers and enlisted personnel about the topics included in our survey, and about the challenges of conducting planned maintenance and repairs. We toured spaces where maintenance personnel encountered challenges and observed the performance of planned maintenance. For the location, ship name, hull number, and class of ships we visited see table 1.

**Appendix II: Objectives, Scope, and Methodology**

**Table 1: Ships and Locations Visited During the Course of Our Review**

<b>Location</b>	<b>Ship name and (hull number)</b>	<b>Ship class and type</b>
Norfolk, Virginia	USS Eisenhower (CVN-69)	Nimitz-class aircraft carrier
	USS Forrest Sherman (DDG-98)	Arleigh Burke-class guided missile destroyer
	USS Arlington (LPD-24)	San Antonio-class amphibious transport dock
	USS Albany (SSN-753)	Los Angeles-class attack submarine
	USS New Hampshire (SSN-778)	Virginia-class attack submarine
San Diego, California	USS Lake Erie (CG-70)	Ticonderoga-class guided missile cruiser
	USS Abraham Lincoln (CVN-72)	Nimitz-class aircraft carrier
	USS Germantown (LSD-42)	Whidbey Island-class dock landing ship
	USS Alexandria (SSN-757)	Los Angeles-class attack submarine
Everett, Washington	USS Barry (DDG-52)	Arleigh Burke-class guided missile destroyer
	USS Kidd (DDG-100)	Arleigh Burke-class guided missile destroyer
Bremerton, Washington	USS Connecticut (SSN-22)	Seawolf-class attack submarine
Bangor, Washington	USS Nevada (SSBN-733)	Ohio-class ballistic missile submarine
	USS Ohio (SSGN-726)	Ohio-class guided missile submarine
Pearl Harbor, Hawaii	USS Daniel Inouye (DDG-118)	Arleigh Burke-class guided missile destroyer
	USS Charlotte (SSN-766)	Los Angeles-class attack submarine
	USS Hawaii (SSN-776)	Virginia-class attack submarine
	USS Minnesota (SSN-783)	Virginia-class attack submarine
Yokosuka, Japan	USS Milius (DDG-69)	Arleigh Burke-class guided missile destroyer
	USS Higgins (DDG-76)	Arleigh Burke-class guided missile destroyer
	USS Shoup (DDG-86)	Arleigh Burke-class guided missile destroyer
	USS Dewey (DDG-105)	Arleigh Burke-class guided missile destroyer
Sasebo, Japan	USS Pioneer (MCM-9)	Avenger-class mine countermeasures ship
	USS Chief (MCM-14)	Avenger-class mine countermeasures ship
	USS Rushmore (LSD-47)	Whidbey Island-class dock landing ship

Source: GAO site visits related to sailor-led maintenance. | GAO-24-106525

To address all three of our objectives, we also contacted several offices and commands within the Department of Defense and the Department of the Navy, such as the Office of the Chief of Naval Operations and shore and fleet commands that support efforts to address challenges relevant to our report objectives. For the organizations that we interviewed during our review see table 2.

**Appendix II: Objectives, Scope, and Methodology**

**Table 2: Organizations Interviewed During Our Review of Sailor-Led Maintenance**

<b>Lead organization</b>	<b>Subordinate organizations</b>
Office of Secretary of Defense	<ul style="list-style-type: none"> <li>• Under Secretary of Defense (Acquisition and Sustainment)</li> <li>• Defense Logistics Agency (DLA)               <ul style="list-style-type: none"> <li>◦ DLA Distribution Yokosuka (Sasebo)</li> </ul> </li> <li>• Under Secretary of Defense (Comptroller), and Chief Financial Officer</li> </ul>
Secretary of the Navy	<ul style="list-style-type: none"> <li>• Assistant Secretary of the Navy for Research, Development and Acquisition               <ul style="list-style-type: none"> <li>◦ Program Executive Office, Manpower, Logistics, and Business Solutions</li> </ul> </li> <li>• Assistant Secretary of the Navy (Financial Management and Comptroller)</li> </ul>
Office of the Chief of Naval Operations (OPNAV)	<ul style="list-style-type: none"> <li>• Deputy Chief of Naval Operations (DCNO) Personnel, Manpower, and Training/Chief of Naval Personnel (CNO N1)</li> <li>• Navy Manpower Analysis Center</li> <li>• DCNO for Information Warfare/Director of Naval Intelligence (CNO N2/N6)</li> <li>• DCNO for Fleet Readiness and Logistics (CNO N4)</li> <li>• DCNO for Integration of Capabilities &amp; Resources (CNO N8)</li> <li>• DCNO for Warfare Systems (CNO N9)</li> </ul>
U.S. Fleet Forces Command	<ul style="list-style-type: none"> <li>• Commander, Naval Air Force Atlantic</li> <li>• Commander, Naval Submarine Force Atlantic</li> <li>• Commander, Naval Surface Force Atlantic</li> <li>• Office of the Director, Fleet Maintenance (N43)</li> <li>• Board of Inspection and Survey</li> <li>• Commander, Naval Information Forces</li> <li>• Naval Computer and Telecommunications Area Master Station Pacific</li> </ul>
U.S. Pacific Fleet	<ul style="list-style-type: none"> <li>• Commander, Naval Air Forces, Pacific Fleet</li> <li>• Commander, Naval Submarine Forces, Pacific Fleet</li> <li>• Commander, Naval Surface Forces, Pacific Fleet</li> </ul>
Naval Sea Systems Command (NAVSEA)	<ul style="list-style-type: none"> <li>• Program Executive Office, Integrated Warfare Systems</li> <li>• Naval Sea Logistics Center</li> <li>• Naval Undersea Warfare Center- Keyport               <ul style="list-style-type: none"> <li>◦ Obsolescence Management Division</li> </ul> </li> <li>• Mid-Atlantic Regional Maintenance Center (MARMC)</li> <li>• Pearl Harbor Shipyard and Intermediate Maintenance Facility</li> <li>• Portsmouth Naval Shipyard, Point Loma Detachment</li> <li>• Puget Sound Naval Shipyard &amp; Intermediate Maintenance Facility</li> <li>• US Naval Ship Repair Facility and Japan Regional Maintenance Center</li> </ul>
Naval Supply Systems Command	<ul style="list-style-type: none"> <li>• Weapon Systems Support               <ul style="list-style-type: none"> <li>◦ Engineering and Product Support</li> <li>◦ Provisioning, Outfitting and Supply Chain Analytics</li> </ul> </li> </ul>

Source: GAO analysis based on interviews conducted related to sailor-led maintenance. | GAO-24-106525

We assessed the reliability of computer-generated data by (1) reviewing existing information about the data and the systems that produced them; (2) sending data reliability questionnaires to system owners and reviewing their responses; and (3) interviewing knowledgeable agency officials in the United States Fleet Forces Command and United States Surface Forces Pacific Fleet Command about the quality control procedures used to ensure the accuracy and completeness of the data. We also compared the data with other documentation relevant to each objective. We found that most of the data we examined were sufficiently reliable to establish Navy-wide trends.

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**Methods Used to Evaluate  
the Extent to Which the  
Navy Provides Personnel  
and Training for  
Completing Sailor-Led  
Maintenance**

For our first objective, we reviewed documents and Navy officials' testimony before Congress related to the total number of Navy personnel. We also obtained and analyzed data on the number of personnel required from the Naval Vessel Registry and Ship Manpower Documents. Navy Personnel Command also provided detailed data on personnel assigned to each of the 25 ships we visited. These data included assigned personnel, rating, department, division, and quality of alignment. We also collected information on the number of personnel that "mustered" or reported for work on a given day for selected ships. To evaluate the number of personnel reporting for duty on a given day we compared the number of required personnel to the number of funded, assigned, and mustering personnel for selected ships. To evaluate whether sailors are prepared for the positions they fill, we reviewed the quality of alignment data, by department, for each of the 25 ships we visited. Because we collected data on a non-generalizable sample of ships, we cannot definitively state that all sailors with heavy maintenance workloads fleetwide are less experienced or possess fewer advanced skills than other sailors. However, our results are consistent with the survey responses that we obtained from executive officers from 91 percent of the active battle fleet that we surveyed.

For determining the reliability of data related to quality of alignment for personnel assigned to specific positions aboard ship, we sent the system owner a reliability questionnaire and analyzed the results. We also reviewed each data field with Naval Personnel Command and discussed the ways in which the command used the data. We found that these data were sufficiently reliable for the purpose of comparing quality of alignment across departments.

In addition, we reviewed information provided by Naval Education and Training Command (NETC) on initial skills training ("A" school) and advanced skills course ("C school") completion. We also reviewed NETC



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data on the extent of trouble-shooting objectives contained in “A” school curriculum.

We also reviewed recent data on fleet material readiness (maintenance accomplishment).<sup>4</sup> The Fleet Analysis Center at Fleet Forces Command produces a semi-annual briefing that provides information on, among other things, trends in maintenance backlogs. We reviewed data from that briefing on trends in the backlog of total and mission-limiting sailor-led maintenance actions and verified the numbers with Fleet Forces Command personnel.<sup>5</sup>

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### Methods Used to Evaluate the Extent to Which the Navy Provides Parts and Materials for Completing Sailor-Led Maintenance

For our second objective, we reviewed metrics for the 232 ships that were part of the scope of our review. We analyzed the availability of parts and materials for conducting sailor-led maintenance aboard ship by comparing Navy Coordinated Shipboard Allowance List (COSAL) gross effectiveness rates to Navy data in the Open Architecture Retrieval System (OARS) database.<sup>6</sup> Specifically, the Navy provided us with a spreadsheet that included data on all ships that were active during at least part of the period from 2017 through 2022. We calculated the percent of ships that met the target as well as the average target fulfillment for all ships. We selected the gross effectiveness rate, which measures the probability that any requested item is onboard when needed, as an overall means of assessing whether spare parts and materials were available to sailors to conduct shipboard maintenance. The Navy calculates other metrics that help it to determine the availability of parts and materials within the global supply infrastructure, but we

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<sup>4</sup>U.S. Fleet Forces Command, which provided the data, is a shore command whose missions are to train, certify; and provide combat-ready forces; plan and execute assigned service functions; provide operational planning and coordination support; and plan and execute joint missions.

<sup>5</sup>The Navy classifies ship maintenance work items at three levels: Organizational-level maintenance (sailor-led maintenance), is the lowest maintenance echelon and consists of all maintenance actions within the capability and resources provided to the ship’s force. Intermediate-level maintenance requires a higher skill, capability or capacity than organizational-level maintenance, and is normally accomplished by a centralized repair facility. Depot-level maintenance is the highest maintenance echelon, consisting of tasks focused on repair, fabrication, overhaul, and system upgrades which requires personnel with higher technical skills beyond intermediate-level maintenance. Chief of Naval Operations Instruction (OPNAVINST) 4700.7M, *Maintenance Policy for United States Navy Ships* (May 8, 2019).

<sup>6</sup>The COSAL establishes spare and repair parts, maintenance assistance modules, operating space items, test equipment, and special tools required to operate and maintain systems and equipment installed in U.S. Navy ships.

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selected gross effectiveness as most germane to our review given our focus on organizational-level (sailor-led) maintenance.

To assess the reliability of these data, which were drawn from the Navy's Open Architectural Retrieval System (OARS), we interviewed Navy officials who use and reconcile OARS data back to legacy source systems. Navy officials estimated the data reliability of OARS is anywhere from 70 to 93 percent accurate, depending on the ship class. Navy officials determined OARS has completeness/compilation issues stemming from maintenance record data transmission problems. However, Naval Sea Logistics Center personnel that own the OARS system indicated that they are aware of only a few data reliability issues associated with missing data fields, but they do not affect the validity of data used for calculating COSAL effectiveness. As a result, we determined that OARS data are sufficiently reliable to permit the use of COSAL data for calculating gross effectiveness for the purposes of our report.

To compare allowance list updates to the timing of depot maintenance periods, we requested and received data from the office of the Deputy Chief of Naval Operations for Fleet Readiness and Logistics on allowance list updates for 115 of the ships in the active battle fleet and that we included in our survey. We also received data on an additional 24 support and logistics ships. However, we excluded these as being outside our scope.

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Methods Used to Evaluate the Extent to Which the Navy Provides Management Processes and Systems for Completing Sailor-Led Maintenance

For our third objective, we reviewed documentation from the Navy Board of Inspection and Survey, specifically, the U.S. Navy Board of Inspection and Survey Annual Report to Congress (March 1, 2023). We also reviewed cost, schedule, and budget information related to the Navy's Naval Maintenance, Repair, and Overhaul (N-MRO) program provided by the Program Executive Office for Manpower, Logistics, and Business Solutions. We attended a Navy-wide conference on the status of N-MRO in Norfolk, Virginia, in November 2023.

Where appropriate, we considered selected information from the Project Management Institute, and *Standards for Internal Control in the Federal Government*.<sup>7</sup> We found that certain key practices and principles of internal controls—such as those related to monitoring activities, as well as

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<sup>7</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 2014).

quality information and sharing such information internally and externally—were relevant and could assist Navy in its efforts to update and consolidate its data management systems for sailor-led maintenance.

We conducted this performance audit from January 2023 to September 2024 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.

# Appendix III: Comments from the Department of the Navy



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From: Program Executive Officer, Manpower, Logistics and Business Solutions (PMW 200)  
To: Director, Defense Capabilities Management, U.S. Government Accountability Office

Subj: DEPARTMENT OF DEFENSE RESPONSE TO THE U.S. GOVERNMENT  
ACCOUNTABILITY OFFICE DRAFT REPORT, GAO-24-1065

Encl: (1) DOD Comments to the GAO Recommendation

1. Enclosure (1) provides the Department of Defense response to the Government Accountability Office (GAO) Draft Report, GAO-24-106525, 'NAVY READINESS: Actions Needed to Improve Support for Sailor-Led Maintenance,' of June 27, 2024 (GAO Code 1065).

2. I am the Primary Action Officer assigned to the audit and can be reached via email: jeffrey.a.baur.civ@us.navy.mil and phone: (703) 350-1088.

A handwritten signature in black ink, appearing to read "J. Baur", is positioned above the printed name.

JEFFREY A. BAUR

GAO DRAFT REPORT DATED JUNE 27, 2024  
GAO-24-106525 (GAO CODE 106525)

“NAVY READINESS: ACTIONS NEEDED TO IMPROVE SUPPORT FOR SAILOR-  
LED MAINTENANCE”

DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION

**RECOMMENDATION 1:** The GAO recommends that the Secretary of the Navy should ensure that the Deputy Chief of Naval Operations for Personnel, Manpower, and Training updates Navy policy to require the Navy to periodically gather and report personnel data specific to sailor-led maintenance, such as comparing assigned personnel to the number of mustering personnel available for duty and tracking the quality of sailors’ alignment across departments

**DoD RESPONSE:** Concur.

**RECOMMENDATION 2:** The GAO recommends that the Secretary of the Navy should ensure that the Commander, Naval Education and Training Command, evaluates and optimizes the balance between classroom training and on-the-job training on maintenance skills for junior sailors as it implements Ready Relevant Learning.

**DoD RESPONSE:** Concur.

**RECOMMENDATION 3:** The GAO recommends that the Secretary of the Navy should ensure that policy is updated to include commanding officers as key stakeholders in updating maintenance cards to better reflect actual time expended in accomplishing sailor-led maintenance tasks in light of ship-specific conditions.

**DoD RESPONSE:** Concur.

**RECOMMENDATION 4:** The GAO recommends that the Secretary of the Navy, in collaboration with Naval Sea Systems Command, should ensure that maintenance cards are written at an appropriate level of detail to reflect specific conditions affecting the amount of time, number of personnel needed, and training necessary to conduct sailor-led maintenance.

**DoD RESPONSE:** Concur.

**RECOMMENDATION 5:** The GAO recommends that the Secretary of the Navy should direct the Deputy Chief of Naval Operations for Fleet Readiness and Logistics, in collaboration with Naval Supply Systems Command and Naval Sea Systems Command, to ensure that shipboard allowance lists are updated and accurate.

**DoD RESPONSE:** Concur.

**RECOMMENDATION 6:** The GAO recommends that the Secretary of the Navy should ensure that the Deputy Chief of Naval Operations for Fleet Readiness and Logistics, in collaboration with Naval Sea Systems Command and Naval Supply Systems Command, clarifies guidance to specify how and when program offices must use readiness-based sparing.

**DoD RESPONSE:** Concur.

**RECOMMENDATION 7:** The GAO recommends that the Secretary of the Navy should ensure that the Assistant Secretary of the Navy for Research, Development, and Acquisition, in conjunction with the Program Executive Office for Manpower, Logistics, and Business Solutions, establishes a mechanism for management to periodically communicate quality information throughout the Navy to ensure stakeholders fully understand the purpose of the N-MRO program and its applicability to their organizations and successfully enlists users in solving remaining challenges.

**DoD RESPONSE:** Concur.

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# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

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## Staff Acknowledgments

In addition to the contact listed above, Sally Newman (Assistant Director), John E. “Jet” Trubey (Analyst-in-Charge), David M. Ballard, Scott Behen, John C. Craig, Victoria Gonzalez, Michael Holland, David L. Jones, Alberto Leff, Felicia Lopez, Keith E. McDaniel (retired), Jean McSween, Christie Pugnetti, Clarice Ransom, Rebecca Guerrero, and Filip Stojkovski made key contributions to this report.

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# Related GAO Products

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*Navy Readiness: Actions Needed to Improve the Reliability and Management of Ship Crewing Data.* [GAO-24-105811](#). Washington, D.C.: Apr. 29, 2024.

*Navy Readiness: Challenges to Addressing Sailor Fatigue in the Surface Fleet Continue,* [GAO-24-106819](#). Washington, D.C.: Oct. 11, 2023.

*Military Readiness: Improvement in Some Areas, but Sustainment and Other Challenges Persist.* [GAO-23-106673](#). Washington, D.C.: May 2, 2023.

*Weapon System Sustainment: Navy Ship Usage Has Decreased as Challenges and Costs Have Increased.* [GAO-23-106440](#). Washington, D.C.: Jan. 31, 2023.

*Military Readiness: Actions Needed to Further Implement Predictive Maintenance on Weapon Systems.* [GAO-23-105556](#). Washington, D.C.: Dec. 8, 2022.

*Military Depots: DOD Strategy for Addressing Deteriorating Facilities and Equipment Is Incomplete.* [GAO-22-105009](#). Washington, D.C.: May 9, 2022.

*Navy Ships: Applying Leading Practices and Transparent Reporting Could Help Reduce Risks Posed by Nearly \$1.8 Billion Maintenance Backlog.* [GAO-22-105032](#), Washington, D.C.: May 9, 2022.

*Navy Ship Maintenance: Actions Needed to Monitor and Address the Performance of Intermediate Maintenance Periods.* [GAO-22-104510](#). Washington, D.C.: Feb. 8, 2022.

*Navy Ships: Timely Actions Needed to Improve Planning and Develop Capabilities for Battle Damage Repair.* [GAO-21-246](#). Washington, D.C. Jun. 2, 2021.

*Navy Readiness: Additional Efforts Are Needed to Manage Fatigue, Reduce Personnel Shortfalls, and Implement Training.* [GAO-21-366](#). Washington, D.C.: May 27, 2021.

*Navy and Marine Corps: Services Continue Efforts to Rebuild Readiness, but Recovery Will Take Years and Sustained Management Attention.* [GAO-21-225T](#). Washington, D.C. Dec. 2, 2020.



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Related GAO Products

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*Navy Ship Maintenance: Actions Needed to Address Maintenance Delays for Surface Ships Based Overseas.* [GAO-20-86](#). Washington, D.C.: Feb. 26, 2020.

*Navy Force Structure: Actions Needed to Ensure Proper Size and Composition of Ship Crews,* [GAO-17-413](#). Washington, D.C.: May 18, 2017.

*Defense Inventory: Further Analysis and Enhanced Metrics Could Improve Service Supply and Depot Operations.* [GAO-16-450](#). Washington, D.C.: June 9, 2016.

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

*Sustainable Plan and Comprehensive Assessment Needed to Mitigate Long-Term Risks to Ships Assigned to Overseas Homeports.* [GAP-15-329](#). Washington, DC: May 29, 2015.

*Military Readiness: Navy Needs to Assess Risks to Its Strategy to Improve Ship Readiness,* [GAO-12-887](#). Washington, D.C.: Sep. 21, 2012.

*Defense Inventory: Opportunities Exist to Improve Spare Parts Support Aboard Deployed Navy Ships,* [GAO-03-887](#). Washington, D.C.: Aug. 29, 2003.

*Navy Maintenance: Ship Maintenance Strategies Need Better Assessments.* [NSIAD-88-187](#). Washington, D.C.: June 14, 1988.

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