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NAVY AND MARINE CORPS

Services Continue Efforts to Rebuild Readiness, but Recovery Will Take Years and Sustained Management Attention

Statement for the Record by Diana Maurer, Director, Defense Capabilities and Management

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GAO Highlights

Highlights of GAO-21-225T, a statement for the record to the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate

Why GAO Did This Study

The 2018 National Defense Strategy emphasizes that restoring and retaining readiness is critical to success in the emerging security environment. The Navy and Marine Corps are working to rebuild the readiness of their forces while also growing and modernizing their aging fleets of ships and aircraft. Readiness recovery will take years as the Navy and Marine Corps address their multiple challenges and continue to meet operational demands.

This statement provides information on readiness challenges facing (1) the Navy ship and submarine fleet and (2) Navy and Marine Corps aviation. GAO also discusses its prior recommendations on Navy and Marine Corps readiness and the progress that has been made in addressing them.

This statement is based on previous work published from 2016 to November 2020—on Navy and Marine Corps readiness challenges, including ship maintenance, sailor training, and aircraft sustainment. GAO also analyzed data updated as of November 2020, as appropriate, and drew from its ongoing work focused on Navy and Marine Corps readiness.

What GAO Recommends

GAO made more than 90 recommendations in prior work cited in this statement. The Department of Defense generally concurred with most of GAO's recommendations. Continued attention to these recommendations can assist the Navy and the Marine Corps as they seek to rebuild the readiness of their forces.

View GAO-21-225T. For more information, contact Diana Maurer at (202) 512-9627 or maurerd@gao.gov.

What GAO Found

The Navy and Marine Corps continue to face significant readiness challenges that have developed over more than a decade of conflict, budget uncertainty, and reductions in force structure. These challenges prevent the services from reaping the full benefit of their existing forces and attaining the level of readiness called for by the 2018 National Defense Strategy. Both services have made encouraging progress identifying the causes of their readiness decline and have begun efforts to arrest and reverse it (see figure). However, GAO's work shows that addressing these challenges will require years of sustained management attention and resources. Recent events, such as the ongoing pandemic and the fire aboard the USS *Bonhomme Richard* affect both current and future readiness and are likely to compound and delay the services' readiness rebuilding efforts.

Selected Navy and Marine Corps Readiness Challenges

Maintenance

The Navy is frequently unable to complete scheduled ship maintenance on time and incurred over 38,900 days of maintenance delay from fiscal year 2014 through fiscal year 2020. This equates to the loss of 15 ships on average each year. The factors contributing to maintenance delays include insufficient shipyard capacity, shortage of skilled personnel, and deferred maintenance during operational deployments.

Similarly, delays in depot maintenance contribute to limited Navy and Marine Corps aircraft availability, as do shortages of maintainer personnel and diminishing manufacturing sources for parts.

Personnel

The Navy is reassessing and increasing the personnel requirements for its ships, but does not expect to crew its ships to these updated baselines for several more years.

Training

The Navy has installed protections to ensure that ship crews are trained and certified prior to deploying, and is in the process of reforming enlisted sailor training.

However, GAO found that changes made to surface warfare officer training could be further enhanced to ensure its effectiveness.

Source: GAO. | GAO-21-225T

Continued progress implementing GAO's prior recommendations will bolster ongoing Navy and Marine Corps efforts to address these readiness challenges.

Chairman Sullivan, Ranking Member Kaine, and Members of the Subcommittee:

I am pleased to submit this statement on issues related to Navy and Marine Corps readiness.

We have long noted the challenges of addressing the needs of the emerging national security environment in the midst of an unsustainable fiscal situation in which the Department of Defense (DOD) accounts for approximately half of the federal government's discretionary spending.[1] Within this environment, DOD is working to rebuild the readiness of its current forces while also modernizing to counter highly capable adversaries as called for in the department's 2018 National Defense Strategy. As DOD contends with these challenges, it is also responding to the COVID-19 pandemic.[2] The Secretary of Defense has stated that his top three priorities during the COVID-19 pandemic are protecting DOD's people, maintaining military readiness, and supporting the whole-of-government interagency response.

This statement provides information on readiness challenges facing (1) the Navy ship and submarine fleet and (2) Navy and Marine Corps aviation.

This statement is based on reports that we issued from 2016 to November 2020 examining the challenges that the Navy and Marine Corps face regarding readiness, shipyard workforce and capital investment, weapon system sustainment, and Navy and Marine Corps aviation, among others.[3] To perform our prior work, we analyzed Navy and Marine Corps readiness, maintenance, personnel, and training data and interviewed cognizant Navy and Marine Corps officials. The reports cited throughout this statement contain more details on the scope of the

[1]GAO, *The Nation's Fiscal Health: Action Is Needed to Address the Federal Government's Fiscal Future,* GAO-20-403SP (Washington, D.C.: March 12, 2020) and GAO, *Department of Defense: Actions Needed to Address Five Key Mission Challenges*, GAO-17-369 (Washington, D.C.: June 13, 2017).

[2]We have issued several reports on the effects of COVID-19 on government operations, including GAO, *COVID-19: Federal Efforts Could Be Strengthened by Timely and Concerted Actions,* GAO-20-701 (Washington, D.C.: September 21, 2020). We have additional reviews underway and expect to report the results of this work in a series of reports over the coming months.

[3]A list of related classified and unclassified GAO products is provided in the Related GAO Products pages at the end of this statement.

work and the methodology we used to carry it out. This statement also includes observations based on our ongoing work focused on Navy and Marine Corps readiness and updates to information and selected data from our prior reports as of November 2020, as appropriate. For ongoing work and updates, we reviewed Navy documentation and interviewed Navy officials. We have also issued several classified reports since 2016 examining these issues; however, this statement does not include that work.

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

Background

DOD has reported that the extended conflict in the post-9/11 era combined with budget uncertainty and reductions in force structure has degraded its readiness. In response, the department has made rebuilding readiness a priority. The 2018 National Defense Strategy emphasizes that restoring and retaining readiness across the entire spectrum of conflict is critical to success in the emerging security environment. Nevertheless, DOD has reported that the readiness of the total military force is low and has remained so since 2013.

DOD has developed a plan to rebuild the readiness of the military force, and the military services provide regular input on the status of their readiness recovery efforts. In August 2018, we reported that the Office of the Secretary of Defense had developed a Readiness Recovery Framework that the department is using to guide the services' efforts and plans to regularly assess, validate, and monitor readiness recovery.[4] Through this framework, the military services have identified key readiness issues that their forces face and actions to address these issues, as well as metrics to assess progress in addressing them. The services have been revising their readiness recovery goals in accordance

[4]GAO, *Military Readiness: Update on DOD's Progress in Developing a Readiness Rebuilding Plan,* GAO-18-441RC (Washington, D.C.: Aug. 10, 2018). The Readiness Recovery Framework identifies primary readiness issues that each military service faces, actions the service has taken to address identified issues, and milestones and metrics to assess progress in addressing those issues.

with the National Defense Strategy and corresponding force employment initiatives, and we have ongoing work assessing DOD's progress in improving readiness.[5]

Over the last several years, the Navy and the Marine Corps have experienced a number of ship and aviation mishaps resulting in the loss of life and hundreds of millions of dollars in damage, underscoring the importance of overcoming these challenges. Several recent events, including the ongoing COVID-19 pandemic and the fire aboard the USS *Bonhomme Richard*, further complicate the services' efforts to rebuild readiness. We testified before the Senate Committee on Armed Services in December 2018[6] and again in December 2019,[7] highlighting current and future readiness challenges and emphasizing that rebuilding readiness will require time and sustained management attention.

The Navy Faces Multiple Challenges to Rebuilding Ship and Submarine Readiness

The Navy faces multiple interrelated challenges in the areas of maintenance, personnel, and training that continue to hinder its efforts to rebuild ship and submarine readiness.

[5]Section 333 of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232 (2018), requires us to report annually until 2021 on the readiness of the armed forces to conduct full spectrum operations in the ground, sea, air, space, and cyber domains. We issued the first of these classified reports in August 2019: GAO, *Military Readiness: Readiness Improved in the Ground and Cyber Domains, But Declined in the Sea, Air, and Space Domains from Fiscal Year 2017 to Fiscal Year 2018,* GAO-19-499C (Washington, D.C.: August 30, 2019). (SECRET).

[6]GAO, *Navy and Marine Corps: Rebuilding Ship, Submarine, and Aviation Readiness Will Require Time and Sustained Management Attention,* GAO-19-225T (Washington, D.C.: December 12, 2018).

[7]GAO, *Navy Maintenance: Persistent and Substantial Ship and Submarine Maintenance Delays Hinder Efforts to Rebuild Readiness*, GAO-20-257T (Washington, D.C.: December 4, 2019).

The Navy Has Made Progress in Reducing Ship and Submarine Maintenance Delays, but Submarine Idle Time Continued to Grow

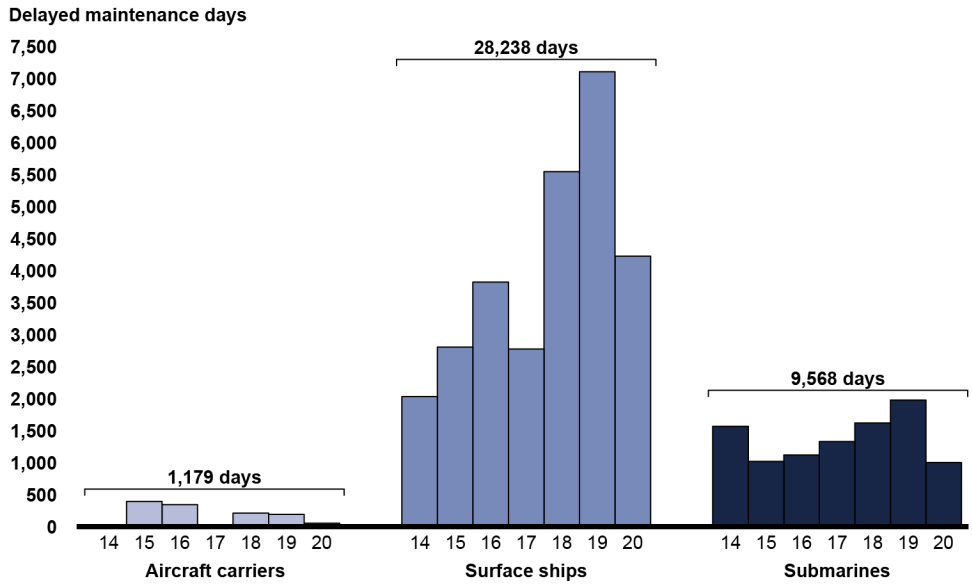
We found that the Navy has made progress reducing ship and submarine maintenance delays in fiscal year 2020, but submarine idle time—periods in which a submarine is awaiting maintenance and unable to conduct normal operations—continued to grow. Idle time and maintenance delays reduce time available for training and operations and incur costs in a resource-constrained environment without providing operational capability. The Navy's readiness recovery is premised on the adherence to set deployment, training, and maintenance schedules. We reported in May 2016 on the difficulty that both the public and private shipyards were having in completing maintenance on time, and we have found that the Navy continues to struggle with this problem.[8]

In December 2019, the Navy established a goal to reduce days of maintenance delay by 80 percent in fiscal year 2020 compared with fiscal year 2019, and eliminate days of maintenance delay by the end of fiscal year 2021. From fiscal year 2014 to the end of fiscal year 2020, the Navy incurred over 38,900 days of maintenance delays (see fig.1). Our analysis of fiscal year 2020 data indicates that the Navy reduced the number of days of maintenance delay from fiscal year 2019 by 43 percent, short of its 80 percent reduction goal. Additionally, Navy projections show that delays will continue through at least fiscal year 2022.[9] According to Navy officials, it is already apparent that there will be delays in fiscal year 2021 because delays in fiscal year 2020 pushed back the start dates for some fiscal year 2021 maintenance periods. These officials said that the effects of COVID-19 on shipyard workforce capacity have been a major cause for the delays, in addition to other factors.

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

[9]The Navy projects that it will incur at least 3,955 days of maintenance delay in fiscal years 2021 and 2022, but the total number of days remains to be seen. Days of maintenance delay are allocated to the year in which they occur.

Figure 1: Number of Days Maintenance was Delayed for Aircraft Carriers, Surface Ships, and Submarines, Fiscal Years 2014–2020



Source: GAO analysis of Navy data. | GAO-21-225T

Note: Delayed maintenance days are allocated to the fiscal year in which they occurred. Data on delayed maintenance days for aircraft carriers for this analysis are limited to the Navy's public shipyards and do not include data from private shipyards. Data for submarines include days of maintenance delay for maintenance conducted at both public and private shipyards. Surface ship maintenance is conducted at private shipyards. We analyzed days of delayed maintenance data as of October 2020.

We also have found that Navy ships based overseas, which are maintained by a mix of Navy-operated facilities and private foreign contractors, experience significant and substantial delays. We reported in February 2020 that maintenance on surface ships based overseas took longer than planned for 50 of the 71 maintenance periods—or about 70 percent—that started during fiscal years 2014 through 2018.[10] More than half of these maintenance delays lasted a month or longer, which reduced the ships' availability for training and operations.

In May 2020, we reported that the Navy has experienced some benefits since shifting to the Multiple Award Contract-Multi Order (MAC-MO) contracting approach for ship maintenance work in 2015—namely, increased competition opportunities, more flexibility to ensure quality of

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

work, and limited cost growth.[11] During the period between April 2015 and April 2019, 21 of 41 ship maintenance periods for major repair work cost less than initially estimated, and average cost growth across the 41 periods was 5 percent. However, we also found that schedule delays persisted, with only 12 of 41 MAC-MO periods completed on time and an average of 30 percent schedule growth across the 41 maintenance periods. To mitigate these delays, the Navy has identified and taken actions to implement lessons learned, including negotiating and funding undefined but expected increases in work at the time of contract award. However, these actions have not resolved the delays that result from the approval process the Navy often must use to obtain funds to complete this maintenance work.

Interrelated Factors Contributing to Delays

Our prior work has found that the Navy's ability to successfully maintain its ships—meaning the completion of all required maintenance on time and within estimated cost—is affected by numerous factors occurring throughout a ship's life cycle.[12] Some of these factors involve decisions made during the acquisition phase, which occurs years before a ship arrives at a shipyard for maintenance. Other factors manifest during operational use of the ship or during the maintenance phase. Decisions based on these factors can be interrelated. For example, decisions to increase deployment lengths to meet the Navy's operational demands can result in declining ship conditions and material readiness. Also, the declining condition of the ships can increase the time that ships spend undergoing maintenance at the shipyards. The increased maintenance time at shipyards can have a ripple effect—officials may have to extend deployment lengths for other ships to compensate for the ships experiencing maintenance delays.

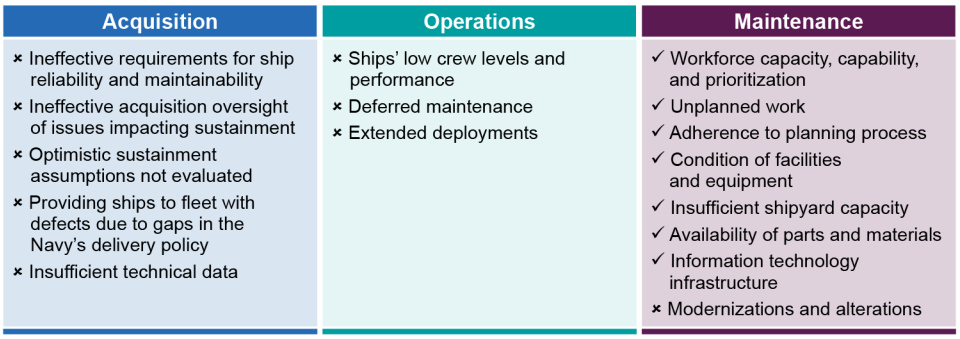
In July 2020, the Navy completed a report identifying the underlying causes of maintenance delays for aircraft carriers, surface ships, and

[11]GAO, *Navy Ship Maintenance: Evaluating Pilot Program Outcomes Could Inform Decisions to Address Persistent Schedule Challenges,* GAO-20-370 (Washington, D.C.: May 11, 2020).

[12]GAO, *Navy Maintenance: Navy Report Did Not Fully Address Causes of Delays or Results-Oriented Elements,* GAO-21-66 (Washington, D.C.: October 29, 2020).

submarines.[13] In October 2020, we found that the Navy's report identified two key causes and several contributing factors regarding maintenance delays, but did not identify other causes.[14] For public shipyards, the Navy's report identified the key cause of maintenance delays as insufficient capacity relative to growing maintenance requirements. For private shipyards, the Navy's report identified the key cause as the addition of work requirements after a contract is awarded. These causes and other identified factors generally align with factors that we have previously identified as originating during the maintenance process. However, the Navy's report did not consider causes and factors originating in the acquisition process or as a result of operational decisions, as shown in figure 2.

Figure 2: Factors Contributing to Delays in Navy Maintenance during Three Phases



✓ = Identified in the Navy's July 2020 report as contributing to maintenance delays
× = Not identified in the Navy's July 2020 report as contributing to maintenance delays

Source: GAO and GAO analysis of Navy documents. | GAO-21-225T

Below we provide details on a number of the factors—acquisition decisions affecting sustainment, workforce challenges at the Navy shipyards, and poor condition of Navy shipyard facilities and equipment—affecting the timeliness of ship and submarine maintenance. When maintenance is not completed on time, fewer ships are available to

[13]Assistant Secretary of the Navy (Research, Development, and Acquisition), *Report to Congress on Aircraft Carrier, Surface Ship, and Submarine Maintenance Delays* (July 22, 2020). The conference committee report accompanying a bill for the Fiscal Year 2020 Consolidated Appropriations Act directed the Navy to conduct an analysis to identify the underlying causes of aircraft carrier, surface ship, and submarine maintenance delays and to submit a report on its findings to congressional defense committees and GAO. H. Rep. Comm. Print No. 38-678, *Consolidated Appropriations Act, 2020*, 138 (January 2020).

[14]GAO-21-66. H. Rep. Comm. Print No. 38-678, *Consolidated Appropriations Act, 2020*, 138 (January 2020) also included a provision for GAO to submit a review of the Navy's report to the congressional defense committees.

conduct training or operations and the Navy can incur significant costs without obtaining operational benefits. We have made recommendations to address them and the Navy has several efforts under way to improve its maintenance operations. However, our work has shown that these will take years to implement, and will require sustained management attention and funding above current levels.

Readiness Challenges Stemming from Lack of Sustainment Analysis during the Acquisition Process

Our prior work has found that the Navy routinely delivers ships to the fleet that need significant maintenance from the first day of service, which leads to backlogs that erode Navy readiness.[15] In March 2020, we found 150 examples of systemic maintenance problems across every class of ship the Navy built during the last 10 years.[16] Sailors showed us problems like failed engines, faulty electronics, and clogged toilets that broke shortly after construction and cost the Navy over $4 billion to fix.[17] The following provide a few examples of sustainment problems that could have been prevented had the Navy identified, evaluated, or mitigated their risks during the acquisition process when ships are designed and constructed:

- The Navy previously determined that over 4,000 parts and systems on Virginia class submarines would not need any maintenance for the duration of the submarine's life. However, many of these parts and systems are consistently failing. This has added unplanned cost and effort to ship maintenance periods. During the acquisition process, the Navy did not fully test and assess the likelihood that most of these parts and systems would be reliable enough to bypass maintenance. As a result, Navy maintenance officials stated that the fleet is planning to pay $360 million over the next 12 years to maintain a part of the propulsion system that it assumed would not need any maintenance for the life of the submarine.
- During the USS *Makin Island's* (LHD 8) first deployment, problems arose with the automated machinery control system that controls

[15]GAO, *Navy Shipbuilding: Policy Changes Needed to Improve the Post-Delivery Process and Ship Quality,* GAO-17-418 (Washington, D.C.: July 13, 2017).

[16]GAO, *Navy Shipbuilding: Increasing Focus on Sustainment Early in the Acquisition Process Could Save Billions,* GAO-20-2 (Washington, D.C.: March 24, 2020).

[17]These problems stemmed from shipbuilding programs not identifying, evaluating, or mitigating sustainment risks during the acquisition process. GAO found that it would cost the Navy at least $4.2 billion to correct the 30 percent of these problems for which the Navy had data on estimated repair costs.

nearly all shipboard systems on LHD 8 and LHA 6 class ships.[18] The system overheated, leading to a failure of the electrical distribution system and a loss of power to the entire ship on multiple occasions. The Navy selected the machinery control system early in the acquisition process to enable reduced crew sizes and sustainment costs. At the end of the shipbuilding process, the Navy discovered that the system required more maintenance and sustainment effort than planned. Further, the technical data provided by the manufacturer, according to Navy engineers, were insufficient for the sailors to operate, troubleshoot, and repair the system. As a result, the Navy has spent over $90 million to repair the software and replace key components of the system on USS *Makin Island* (LHD 8), USS *America* (LHA 6), and USS *Tripoli* (LHA 7).

In all, we found significant deficiencies in how the Navy considers and plans for ship sustainment during the acquisition process. Specifically, we identified deficiencies in the following areas:

- **Developing requirements:** Shipbuilding programs' requirements for sustainment reflect weaknesses with how DOD policy defines these requirements for ships. Sustainment requirements should inform acquisition decisions, such as when developing a ship's design, because they are critical to the sustainability of a ship class. However, the Navy's sustainment requirements do not provide key information on how reliable and maintainable mission-critical systems should be and, therefore, cannot adequately inform acquisition decisions, such as adding redundancy to a key component to ensure availability. For example, the Navy's new FFG(X) frigate class ship can meet its reliability requirement even if it experiences catastrophic failures for over 25 percent of the time it is available for operations.
- **Planning for maintaining ships:** Shipbuilding programs did not consistently address sustainment risks in acquisition planning documents, such as independent logistics assessments and cost estimates. The Navy's operating and support costs included in cost estimates did not capture all sustainment risks that could affect costs or evaluate sensitivity to changing sustainment assumptions, contrary to DOD and Navy cost estimating guidance. As a result, for six

[18]LHD 8 and LHA 6 class ships are amphibious assault ships.

shipbuilding programs whose costs we could assess, the Navy had underestimated sustainment costs by $130 billion.[19]

- **Evaluating ship sustainment during acquisition reviews:** We found that the Navy rarely focused on sustainment during acquisition program reviews with critical Navy leadership despite guidance directing ship programs to do so. The Navy has begun making some changes to its acquisition oversight process, such as developing sustainment program baselines and adding a sustainment oversight review. While positive, these changes focus on considering sustainment after key decisions are made rather than earlier in the acquisition process prior to these decisions. We also found that DOD is not required to provide detailed information about shipbuilding programs' sustainment cost growth to Congress. As such, Congress does not have full insight into the extent of shipbuilding programs' cost growth and why such growth occurred.

To address these deficiencies, we made 11 recommendations to the Navy to improve the costs, logistics, and performance of ships throughout their lifecycles by giving more consideration to ship sustainment early in the acquisition process. We recommended such actions as: improving DOD guidance regarding sustainment requirements, conducting sensitivity analyses in operating and support cost estimates, considering risk during sustainment planning, making changes to ensure the efficacy of independent logistics assessments, and implementing a sustainment program baseline, among others. We also raised a matter for Congress to consider developing an oversight mechanism for evaluating shipbuilding programs' sustainment cost estimate growth during the acquisition process, with requirements for the Navy to: (1) report sustainment cost estimate growth information to Congress and (2) reassess shipbuilding programs that are experiencing a high level of sustainment cost estimate growth. DOD concurred or partially concurred with all 11 recommendations, but did not describe the specific actions it is planning to take to address some of our recommendations. Absent specific actions by DOD and Navy leadership, the Navy is at risk of continuing to provide ships to the fleet that are incomplete, unreliable, and cost more than expected to maintain.

[19]The six shipbuilding programs consist of LPD 17 class amphibious transport dock ships, DDG 1000 class destroyers, LHA 6 class amphibious assault ships, CVN 78 class aircraft carriers, Littoral Combat Ship seaframes, and SSN 774 class submarines. For more information, see GAO-20-2.

Workforce Challenges at Naval Shipyards

We reported in December 2018 that the Navy faced a variety of workforce challenges at the four naval shipyards, such as hiring personnel in a timely manner and providing personnel with the training they needed to gain proficiency in critical skills.[20] The Navy has noted that some occupations require years of training before workers become proficient. According to Navy officials, a large portion of its workforce is inexperienced. For example, 45 percent of the Puget Sound's and 30 percent of the Portsmouth Naval Shipyard's skilled workforces had fewer than 5 years of experience as of December 2018. Further, workforce shortages and inexperience had contributed to lengthy maintenance delays such as occurred with two submarines at Pearl Harbor Naval Shipyard in 2014 and 2015. Maintenance periods for these submarines were delayed by approximately 20 months each, in part because of shortages in skilled personnel.

Most of DOD's depots, which include the naval shipyards, have taken actions to maintain critical skills through retention incentives, bonuses, and awards. However, we found that neither the depots, their higher-level service component commands, nor the services have conducted an assessment to determine the effectiveness of these actions. We recommended that the services, including the Navy, assess the effectiveness of their actions to maintain critical skills in the depot workforce, and DOD agreed. As of June 2020, the Navy was still in the process of collecting information to assess the effectiveness of these actions.

Further, we reported in August 2020 that the Navy has consistently relied on high levels of overtime to carry out planned work at its shipyards.[21] We found that overtime among certain production shops, such as painting or welding, were high, averaging from 25 to 32 percent for fiscal years 2015 through 2019, with peak overtime as high as 45 percent.[22] Shipyard officials told us that production shops at all four shipyards were working beyond their capacity and that such high rates of overtime can lead to

[20]GAO, *DOD Depot Workforce: Services Need to Assess the Effectiveness of Their Initiatives to Maintain Critical Skills*, GAO-19-51 (Washington, D.C.: Dec. 14, 2018).

[21]GAO, *Navy Shipyards: Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines,* GAO-20-588. (Washington, D.C.: August 20, 2020).

[22]A shop working 45 percent overtime in a 40-hour work week would mean an average of 58 hours worked that week per person in the shop.

diminished productivity. We recommended that the Navy update its workforce planning to avoid the consistent use of overtime, and the Navy agreed.

Cost Estimates for Improving the Poor Conditions and Lack of Capacity at Naval Shipyards

We reported in September 2017 that the poor condition of facilities and equipment at the naval shipyards contributed to maintenance delays for aircraft carriers and submarines, hindering the shipyards' ability to support the Navy.[23] Specifically, we found that the average condition of shipyard facilities was poor, that the shipyards faced threats from issues such as chronic flooding and seismic hazards, and that shipyard equipment was generally past its expected service life. Equipment that is past its expected service life can pose an increased risk for maintenance delays or higher maintenance costs, affecting the depots' ability to conduct work. As we have previously reported, aging equipment can present a number of challenges, such as more frequent breakdowns, less effective or efficient operation, and safety hazards.[24]

We also reported in 2019 that the naval shipyards cannot support 68 of the 218 maintenance periods—almost a third—that aircraft carriers and submarines will require through 2040, because they lack sufficient dry dock capacity.[25] Specifically, several of the Navy's 17 dry docks will become obsolete after the Los Angeles class submarines are retired, because they will be too small or lack the appropriate shore-side support to accommodate newer classes of submarines.[26] In addition, no dry dock at any of the naval shipyards can currently support repairs to the Ford class aircraft carrier, even though the Navy accepted delivery of the first ship of that class in 2017.

The Navy has begun to implement a major effort—the Shipyard Infrastructure Optimization Program—that is intended to significantly improve the condition of shipyard facilities and equipment, but it will require significant time, resources, and sustained management attention to implement. This plan is designed to address the bulk of the Navy's dry-

[23]GAO, *Naval Shipyards: Actions Needed to Improve Poor Conditions that Affect Operations*, GAO-17-548. (Washington, D.C.: September 12, 2017).

[24]GAO, *Military Depots: Actions Needed to Improve Poor Conditions of Facilities and Equipment that Affect Maintenance Timeliness and Efficiency*, GAO-19-242 (Washington, D.C.: April 29, 2019).

[25]GAO, *Naval Shipyards: Key Actions Remain to Improve Infrastructure to Better Support Navy Operations,* GAO-20-64. (Washington, D.C.: Nov. 25, 2019).

[26]GAO-20-64.

dock capacity issues and identify the optimal placement of facilities and major equipment at each naval shipyard. The Navy estimates that these changes can ultimately increase its maintenance efficiency by reducing the distance that workers and material will have to travel within the shipyards during the maintenance period. According to the Navy, more efficient layouts at the shipyards have the potential to save about 328,000 labor days per year—an amount roughly equal to the labor needed for an additional submarine maintenance period annually. However, the Navy estimated that these facility improvements will take 20 years to complete. Further, the Navy estimates that it will take 30 years to bring the average age of its equipment to within industry standards.

The Navy estimated in 2018 that its efforts to improve the naval shipyards would require $21 billion over 20 years to implement. However, we found in November 2019 that this $21 billion estimate does not include inflation and other significant costs, such as those for utilities, roads, or environmental remediation, which could add billions to the final cost. Moreover, even at a cost of $21 billion, this effort would require funding levels beyond what the Navy has requested for shipyard infrastructure in recent years. In November 2019, we recommended that the Navy prepare more accurate cost estimates, using best practices, so that it can request accurate funding from Congress and avoid common pitfalls associated with inaccurate estimates, such as cost overruns, missed deadlines, and performance shortfalls.[27] We also recommended that the Navy take steps to improve its cost estimate prior to the start of its primary facility improvement effort. The Navy concurred with these recommendations, and plans to update its estimates in 2022 when it completes its planning efforts to optimize the layout of the shipyards.

Effects of Maintenance Delays on Ship Availability for Training and Operations

When maintenance is not completed on time, fewer ships are available to conduct training or operations and the Navy can incur significant costs without obtaining operational benefits. We reported in December 2019 that maintenance delays had resulted in the equivalent of the Navy losing 19 surface ships in fiscal year 2019.[28] Days of maintenance delay incurred in fiscal year 2020 equate to the loss of 11 surface ships.

Further, maintenance delays are costly. In November 2018, we examined maintenance delays for attack submarines and reported that the Navy

[27]GAO-20-64.

[28]GAO-20-257T.

had incurred significant operating and support costs to crew and maintain attack submarines that were delayed during maintenance periods.[29] We estimated that from 2008 to 2018, the Navy spent $1.5 billion to support attack submarines that provided no operational capability—attack submarines that were sitting idle and no longer certified to conduct normal operations while waiting to enter the shipyards and those whose maintenance was delayed while they were at the shipyards.[30] We recommended that the Navy conduct a business case analysis to inform its allocation of maintenance workload across public and private shipyards. The Navy concurred with this recommendation and, in December 2018, issued a five-year submarine maintenance plan outlining actions to reduce submarine idle time and maintenance delays.

Our analysis shows that submarine idle time continues to grow. In August 2020, we reported that submarine idle time increased year over year from 100 days in fiscal year 2015 to 1,019 days in fiscal year 2019—a 919 percent increase (see fig. 3).[31] Further analysis of the Navy's idle time data shows that idle time grew to 1,188 days during fiscal year 2020, and the Navy projects idle time to increase to 1,424 days during fiscal year 2021. Specifically, the Navy projects that all 11 submarine maintenance periods planned to start in fiscal year 2021, or that incurred idle time in both fiscal years 2020 and 2021, will incur an average of approximately 129 days of idle time during fiscal year 2021.[32]

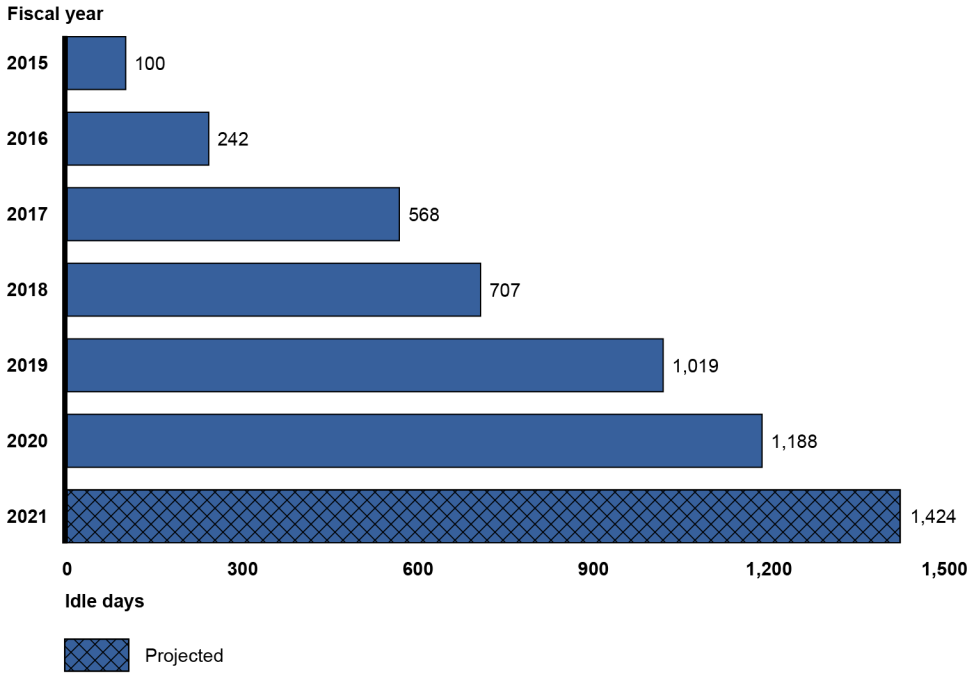
[29]GAO, *Navy Readiness: Actions Needed to Address Costly Maintenance Delays Facing the Attack Submarine Fleet*, GAO-19-229 (Washington, D.C.: Nov. 19, 2018).

[30]We calculated the costs in fiscal year 2018 constant dollars. While acknowledging the magnitude of these costs, Navy officials stated that there may be some benefits that could be realized from supporting these idle attack submarines since crews on idle attack submarines can conduct some limited training. GAO-19-229.

[31]GAO-20-588.

[32]As of October 2020, the Navy projected that five submarines will incur 729 days of idle time in fiscal year 2022, or about half of the idle time the Navy expects to incur during fiscal year 2021. However, any delays in submarine maintenance in fiscal year 2021 may negatively affect idle time. Delays in starting and completing maintenance can lead to a "bow wave effect" where delays in completing one maintenance period can affect the start time of the next scheduled maintenance period.

Figure 3: Idle Time Incurred or Projected prior to Submarine Maintenance Periods from Fiscal Years 2015 through 2021



Source: GAO analysis of Navy data. | GAO-21-225T

Note: Idle time occurs on submarines whose safety certifications have expired or will soon expire and prevent the submarines from performing submerged operations while awaiting available facilities to begin a maintenance period.

The July 2020 fire aboard the USS *Bonhomme Richard* (LHD 6) as it was nearing the end of a scheduled maintenance period will likely have downstream effects on the Navy's operations as well its capacity to maintain other ships. USS *Bonhomme Richard* is one of only 10 amphibious assault ships that forms the centerpiece of an amphibious ready group or expeditionary strike group. While damage assessments are ongoing, the loss of this capability while repairs are under way—or the more severe prospect of permanently removing the ship from the fleet—will likely require that other ships take up the USS *Bonhomme Richard's* expected share of operations until it is repaired or replaced. This may have cascading readiness effects on the substitute ships assuming the damaged ship's operational load, such as higher operational tempos, compressed or deferred maintenance and unit-level training periods, and reduced downtime for ship crews.

Further, emergent repairs, such as those following the fatal 2017 collisions of both the USS *Fitzgerald* (DDG 62) and the USS *John S.*

McCain (DDG 56), show that extensive repairs tend to take longer and cost more than initially estimated. For example, Navy officials told us that the USS *John S. McCain's* repairs took over twice as long as estimated, and both ships experienced complications during their repairs that contributed to schedule and cost increases, such as additional damage discovered over the course of their overhauls. The unexpected schedule and cost growth to return both of these ships to the fleet put further strain on the Navy's budgets and operational schedules, and may offer lessons for the Navy should it decide to repair the fire damage on the USS *Bonhomme Richard*.

Long-Term Personnel Challenges Hinder the Navy's Efforts to Rebuild Readiness

In May 2017, we reported that the Navy's effort to reduce crew sizes in 2003 through 2012 may have been leading to overburdened crews working long hours.[33] These changes also corresponded with increases in maintenance costs that outweighed the savings achieved through reduced personnel costs. In addition, changes made during this time to the Navy's process for determining crew requirements—the number and skill mix of sailors needed on the Navy's ships—did not fully account for all ship workload. Navy officials told us that shifts in maintenance workload from the organizational and intermediate levels to depot-level maintenance increased overall maintenance costs. This change occurred in part because reduced crew sizes resulted in minor maintenance being deferred; which led to more costly issues that had to be addressed later at the depot level. We recommended steps to help ensure that the Navy's crew requirements meet the needs of the existing and future surface fleet.

The Navy has addressed our recommendations by revising the factors used to calculate ship crew sizes, studying in-port workload, and using these changes to begin updating the crew requirements for its ship classes. To date, the Navy has recalculated crew size requirements for five ship classes, and it expects to complete studies for the remaining surface ship classes through 2024. For example, these efforts have resulted in average increases to crew sizes of 32 personnel for DDG 51 class destroyers and 28 personnel for CG 47 class cruisers. However, as the Navy continues to increase the required size of its crews over the next several years, it will need to demonstrate that it can assign crew members to these ships to meet the higher crew levels required.

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

In addition to updating ships' crew requirements, the Navy has also set targets that establish minimum thresholds for filling ship billets with qualified sailors. The Navy has established a minimum threshold of filling at least 95 percent of authorized billets in its ship crews with sailors (referred to as fill), with a minimum goal of 92 percent of those sailors having the right qualifications for the billet (known as fit). The Navy has prioritized crewing its surface ships that are homeported overseas and other deploying ships. According to Navy officials and quarterly manning reports, the Navy is generally meeting its fit and fill targets, based on the number of billets that were authorized before it increased the requirements.

However, meeting the increased requirements will pose challenges. Navy officials have noted that there is a lag between crew requirements being increased and the funding, or authorization, of additional billets. Funding additional billets within the Navy's limited end strength is the first challenge, since there is a constraint on the number of sailors available for distribution across the fleet. The second and perhaps longer-term challenge is recruiting and retaining enough qualified sailors to meet the Navy's rising crew targets and ensuring that ships are safely operated. We have ongoing work examining the Navy's crewing issues and the management of fatigue in ship crews; we plan to report on the results of that work in early 2021.

The Navy's Training Challenges Hinder Readiness Rebuilding

Improving Crew Certifications and Collective Training

In our prior work, we reported on challenges related to (1) expired crew certifications for surface ships (2) the training of Surface Warfare Officers (SWO) and (3) Navy and Marine Corps training ranges. The Navy has taken steps to address these challenges as well as others, such as the training of enlisted sailors. However, many of these actions are in the early stages and we have ongoing work examining the Navy's efforts.

Following two Navy ship collisions in 2017, the Navy focused on training surface ship crews to its existing standards. Rather than allow crews to operate with expired training certifications, the Navy has worked to ensure that surface ships are certified prior to deploying. For example, the Navy established controls to limit waivers that allowed training lapses to worsen, and it now requires multiple high-level approvals for ships to operate uncertified. Our work has shown that the percentage of lapsed certifications on cruisers and destroyers in Japan decreased significantly,

from 41 percent of certifications expired in September 2017, to 9 percent of certifications expired in November 2018, showing a marked improvement.[34] Navy officials have attested that these efforts to certify crews are continuing.

Additionally, the Navy has plans to phase high-level collective training over the next several years into the operational schedules of its ships that are homeported in Japan. Previously, advanced and integrated training involving multiple ships was conducted ad hoc, if at all, for ships homeported in Japan. Such collective training is important, because the 2018 National Defense Strategy states that the department's principal priority is to prepare for threats from strategic competitors due to the magnitude of the threat they pose. However, in November 2018, officials from Fleet Forces Command told us that the command's training approach to prepare for advanced adversaries would not be fully implemented across the fleet for several years. These efforts depend on the investment of billions of dollars over the next decade in live, virtual, and constructive training needed to replicate the high-end threats posed by adversaries. We have ongoing work examining the Navy's collective training efforts and plan to report on the results of that work in early 2021.

Changes to Training for both Officers and Enlisted Personnel

Since 2017, the Navy has made numerous changes to enhance SWO ship-driving training and has plans for further changes. The Navy expects its efforts to triple the number of initial ship-driving training hours for SWOs, by 2021, over the number of training hours that were provided prior to the 2017 collisions. The Navy has added classroom and simulator time to existing training courses to improve skills and is developing two additional simulator-based ship-driving courses for 2021. These improvements hinge on the completion of two new simulator-based training facilities, which are scheduled for completion in June 2021 and January 2023.

The Navy also has added skill checks, to be conducted throughout a SWO's career to ensure that each SWO has basic ship-driving skills. However, as we reported in November 2019, the Navy had at that time not put key processes and assessments in place to comprehensively evaluate the effectiveness of its changes to ship-driving training.[35] Senior Navy officials stated that it could take 16 years or more to know whether

[34]GAO-19-225T.

[35]GAO, *Navy Readiness: Actions Needed to Evaluate the Effectiveness of Changes to Surface Warfare Officer Training,* GAO-20-154 (Washington, D.C.: Nov. 14, 2019).

the planned changes were effective in increasing the ship-driving proficiency of commanding officers across the fleet and that they intended to closely monitor the implementation of changes to the training. We made several recommendations with which the Navy agreed; however, the Navy does not plan to fully implement the recommendations until March 2023.[36]

In an effort to provide more timely and targeted individual training to enlisted sailors, the Navy has created the Ready Relevant Learning initiative, which is in the early stages of implementation and includes plans to divide some training into phased blocks, significantly overhaul most training curriculums, and eventually modernize the means by which training is delivered. We have ongoing work reviewing the implementation of this initiative and expect to issue a report on its progress in early 2021.

Capability and Capacity of Navy and Marine Corps Training Ranges

DOD has identified several challenges to the capability and capacity of Navy and Marine Corps training ranges, particularly to meet the direction in the latest National Defense Strategy for the military services to train to counter advanced adversaries and competitors. For example, DOD has reported that the current size of the Navy's premier range for advanced aviation warfare training at the Fallon Range Training Complex in Nevada severely restricts the extent to which the Navy can realistically train using its various weapons systems as they would be employed in combat. In addition, the boundaries of the Fallon range have not changed to accommodate the capabilities of modern weapons. Similarly, DOD has reported that Marine Corps ranges lack the capability to fully exercise a large-scale, realistic training scenario. For example, the Marine Corps premier combat training range at Twentynine Palms, California, is unable to support a full-scale, live-fire Marine Expeditionary Brigade exercise. The Marine Corps is in the process of expanding the boundaries of these training ranges in an effort to increase its ability to conduct more realistic training, but it is still negotiating the use of the airspace above the expanded land space, so its current use of these training ranges is limited.

[36]Consistent with our recommendations, in H.R. Rep. No. 116-442, at 101 (2020), accompanying a bill for the National Defense Authorization Act for Fiscal Year 2021, the House Armed Services Committee directed the Navy to conduct a top-down assessment of Navy surface warfare training to include an objective assessment of the status of seamanship skills, with a report due to the congressional defense committees not later than February 2, 2022.

Sustainment and Personnel Challenges Limit the Recovery of Navy and Marine Corps Aircraft

Our work has shown that Navy and Marine Corps aircraft mission capable rates—the percentage of total time when the aircraft can fly and perform at least one mission—have been negatively impacted by aging aircraft, delayed maintenance, and insufficient supply support. The growing F-35 program, which is meant to replace many aging aircraft, has presented additional operational and sustainment challenges, which will likely persist into the future. Shortfalls in maintenance personnel further limit readiness recovery across legacy air platforms.

Maintenance and Supply Challenges Limit Availability of Aging Aircraft

Navy and Marine Corps aircraft mission capable rates—used to assess the health and readiness of an aircraft fleet—have been negatively affected by challenges associated with aging aircraft fleets, depot maintenance, and supply support that reduce the services' ability to keep aviation units ready.[37] The Navy and Marine Corps spend billions of dollars each year on sustainment, such as for spare parts and depot maintenance, to meet mission capable goals that are based on operational and training needs.

We reported in August 2020 that of the 19 individual fixed- and rotary-wing types of Navy and Marine Corps aircraft we examined, only one met the service-established mission capable goal for fiscal year 2019.[38] Furthermore, for fiscal year 2019

- three were from 6 to 15 percentage points below the goal; and
- 16 were more than 15 percentage points below the goal, including 11 that were 25 or more percentage points below the goal.

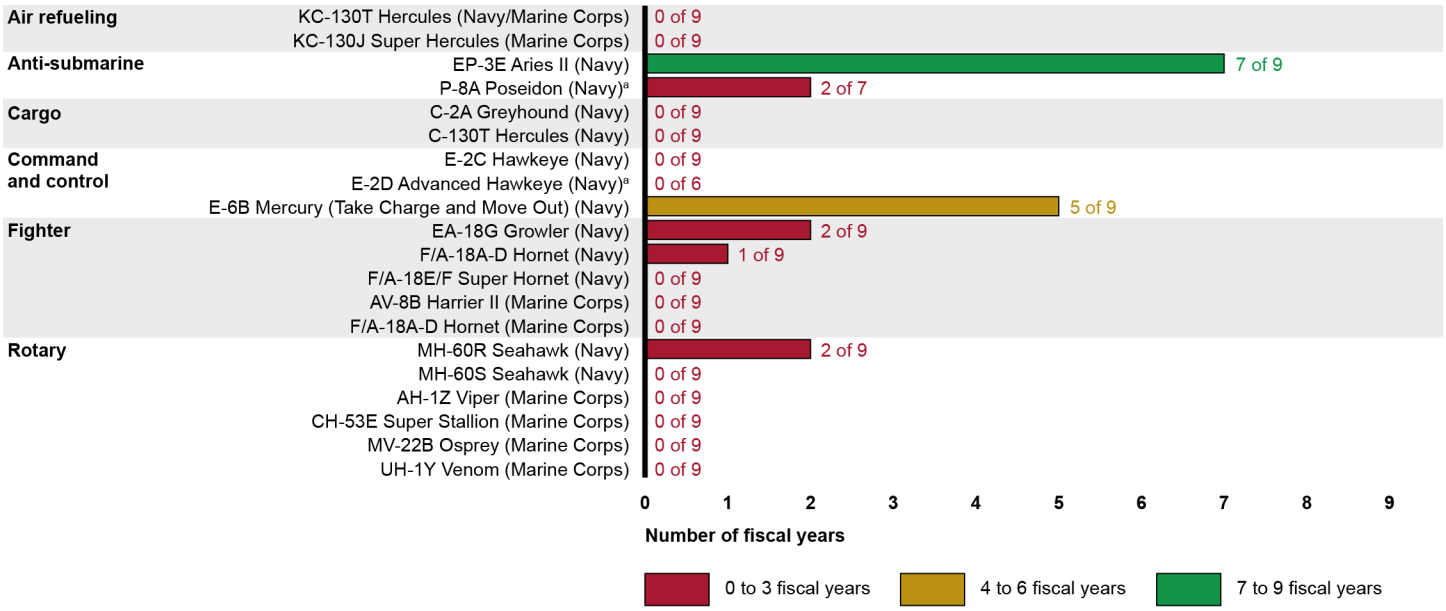
The Navy and Marine Corps ability to meet annual mission capable goals has been a long-standing issue, as shown in figure 4. From fiscal year 2011 through fiscal year 2019, both services were generally unable to meet annual mission capable goals for the 19 aircraft we reviewed. Specifically, only two types of aircraft—EP-3E Aries II and E-6B

[37]GAO, *Weapon System Sustainment: Aircraft Mission Capable Rates Generally Did Not Meet Goals and Cost of Sustaining Selected Weapon Systems Varied Widely,* GAO-21-101SP (Washington, D.C.: November 19, 2020). This was a public version of a more detailed August 2020 sensitive report: GAO, *Weapon System Sustainment: Aircraft Mission Capable Rates Generally Did Not Meet Goals and Cost of Sustaining Selected Weapon Systems Varied Widely*, GAO-20-67SPSU (Washington, D.C.: Aug. 27, 2020). We also reported on aircraft sustainment in *Weapon System Sustainment: Selected Air Force and Navy Aircraft Generally Have Not Met Availability Goals, and DOD and Navy Guidance Need to Be Clarified*, GAO-18-678 (Washington, D.C.: Sept. 10, 2018).

[38]The Navy and Marine Corps F/A-18A-D Hornet fleets have different goals, although we are counting them as one type of aircraft.

Mercury—met the goals in a majority of the years from fiscal year 2011 through fiscal year 2019. Furthermore, 14 types of aircraft did not meet the goal in any fiscal year.

Figure 4: Number of Times Selected Navy and Marine Corps Aircraft Met Their Annual Mission Capable Goal, Fiscal years 2011 through 2019



Source: GAO analysis of Navy data. | GAO-21-225T

Note: Navy F/A-18A-D Hornet aircraft and Marine Corps F/A-18A-D Hornet aircraft are listed separately above because they had different mission capable goals.

Additionally, the average mission capable rate for the Navy's and Marine Corps' 19 selected types of aircraft decreased from fiscal year 2011-2019.[39] Specific mission capable rate data are considered sensitive by the Navy and the Marine Corps, and cannot be discussed in detail.

In addition to the mission capability goals established by the Navy and Marine Corps, in September 2018, the Secretary of Defense issued a memorandum emphasizing that a key component of implementing the 2018 National Defense Strategy is ensuring the mission capability of critical aviation platforms.[40] The memorandum established a goal of

[39]GAO-21-101SP.

[40]Secretary of Defense Memorandum, *NDS Implementation-Mission Capability of Critical Aviation Platforms* (Sept. 17, 2018).

achieving a minimum of 80-percent mission capable rates for various DOD aircraft, including the Navy's F/A-18A-D Hornet, F/A-18E/F Super Hornet and the EA-18G Growler, by the end of fiscal year 2019. We reported in December 2018 that program officials within DOD and the Navy had told us that this goal would be challenging to achieve by the end of fiscal year 2019.[41]

Our analysis showed that mission capable rates generally did improve for these systems over the course of fiscal year 2019, including meeting the 80 percent mission capable rate at particular points of time in fiscal year 2019. However, we found that none of these aircraft achieved the mission capability goal when mission capable rate data were averaged for each day in fiscal year 2019. Navy officials noted that the Navy continues to work at sustaining the progress made during fiscal year 2019. The details of our analysis were deemed sensitive by the Navy and therefore are omitted here.

During the process of conducting our analysis to assess whether the Navy had met the 80 percent goal identified by the Secretary of Defense, we determined that the Navy has two information technology systems that track mission capable rates. These systems use different approaches, and produce different results. According to Navy officials, the Navy uses mission capable rate data from its Aviation Maintenance Supply Readiness Reporting (AMSRR) information technology system to evaluate its progress against the Secretary's 80 percent mission capable goal. These officials further stated that the AMSRR data they are using to track progress against the Secretary's 80 percent mission capable goal allows for a better assessment of the Navy's ability to "fight tonight" because it measures mission capability at a point in time on each day.

The Navy also maintains mission capable rate data, as well as other sustainment data, in its Decision Knowledge Programming for Logistics Analysis and Technical Evaluation (DECKPLATE) information technology system. Navy officials acknowledge that DECKPLATE data provide a more comprehensive measure of the health of aircraft, systems, and components because they measure mission capability based on a percentage of the total time the aircraft is available.

The Navy's AMSRR mission capable rates for fiscal year 2019 are higher for the 19 Navy and Marine Corps aircraft than the DECKPLATE mission

[41]GAO-19-225T.

capable rates for those aircraft for the same fiscal year. While three aircraft—the EP-3E Aries II, the E-6B Mercury, and the F/A-18A-D Hornet—met the service's goals using AMSRR mission capable rate data, one aircraft met the service's mission capable goal for fiscal year 2019 using the DECKPLATE mission capable rates. As there are trade-offs to the different approaches, we did not evaluate the efficacy of the Navy's tracking and reporting of mission capable rates and did not make any related recommendations.

According to the Navy, the pace of operations has increased wear and tear on its aircraft and decreased the time available for maintenance and modernization, which are especially necessary for an aging fleet. For example, the average age of an F/A-18A-D Hornet is nearly 28 years, of an AV-8B Harrier over 24 years, and of a C-2A Greyhound over 32 years. Both services expect to use these aircraft for the foreseeable future and in some cases until 2030.

The Navy and the Marine Corps have also faced delays in the delivery of the F-35 to replace their legacy F/A-18A-D Hornets and AV-8B Harriers.[42] To compensate for the delays, the Navy and the Marine Corps are procuring additional aircraft, such as the F/A-18E-F Super Hornet, and plan to extend the service lives and upgrade the capabilities of their legacy aircraft. However, the sustainment of the Navy and Marine Corps legacy aircraft fleet faces several key challenges (see fig. 5).

[42]GAO-21-101SP and GAO-18-678.

Figure 5: Sustainment Challenges Affecting Selected Navy and Marine Corps Aircraft

	Aging aircraft			Maintenance				Supply support		
	Delays in acquiring replacement aircraft	Service life extension[a]	Unexpected replacement of parts and repairs	Access to technical data	Delays in depot maintenance	Shortage of trained maintenance personnel	Unscheduled maintenance	Diminishing manufacturing source[b]	Parts obsolescence[c]	Parts shortage and delay
Air refueling										
KC-130T Hercules (Navy/Marine Corps)		●	●		●				●	●
KC-130J Super Hercules (Marine Corps)		●	●	●	●					●
Anti-submarine										
EP-3E Aries II (Navy)						●		●		●
P-8A Poseidon (Navy)				●						●
Cargo										
C-2A Greyhound (Navy)		●	●		●	●	●	●	●	
C-130T Hercules (Navy)		●	●		●				●	
Command and control										
E-2C Hawkeye (Navy)			●		●	●	●	●	●	●
E-2D Advanced Hawkeye (Navy)					●	●	●	●	●	
E-6B Mercury (Take Charge and Move Out) (Navy)		●	●			●		●	●	
Fighter										
EA-18G Growler (Navy)					●	●		●	●	●
F/A-18A-D Hornet (Navy/Marine Corps)	●	●	●		●	●	●	●	●	
F/A-18E/F Super Hornet (Navy)		●	●		●	●		●	●	●
AV-8B Harrier II (Marine Corps)	●		●		●	●		●	●	
Rotary										
MH-60R Seahawk (Navy)				●		●	●			●
MH-60S Seahawk (Navy)				●		●	●			●
AH-1Z Viper (Marine Corps)							●			●
CH-53E Super Stallion (Marine Corps)		●	●	●	●	●		●	●	●
MV-22B Osprey (Marine Corps)			●	●		●				●
UH-1Y Venom (Marine Corps)						●	●			●

Source: GAO analysis of Navy information. | GAO-21-225T

[a]A service life extension refers to a modification to extend the service life of an aircraft beyond what was planned.

[b]Diminishing manufacturing sources refers to a loss or impending loss of manufacturers or suppliers of items.

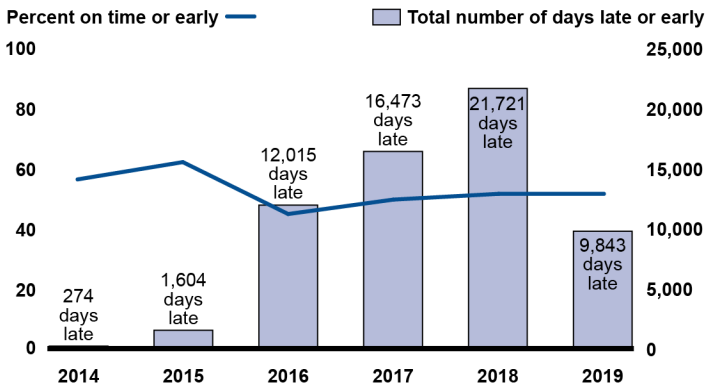
[c]Obsolescence refers to a lack of availability of a part due to its lack of usefulness or its no longer being current or available for production.

Furthermore, our prior work examining depot maintenance has shown that the Navy and the Marine Corps face four interrelated challenges. Specifically,

- **Considerable declines in on-time performance at Navy aviation depots.** We reported in June 2020 that the Navy's aviation depots—referred to as Fleet Readiness Centers—were late in completing aviation depot maintenance of selected fixed-wing aircraft from fiscal

years 2014 through 2019.[43] As shown in figure 6, the annual average percentages for on-time or early-completion maintenance ranged from 45 to 63 percent. In total, the maintenance for selected Navy fixed-wing aircraft has taken over 62,000 more days than expected since fiscal year 2014. Maintenance delays can cause the services to incur operating and support costs without receiving an operational benefit from the weapon system. Lack of operational weapon systems also hinders training leading to a reduction in readiness.

Figure 6: Navy Percentages of Depot Maintenance Completed On Time or Early and Total Days Late or Early for Selected Fixed-Wing Aircraft, Fiscal Years 2014 through 2019

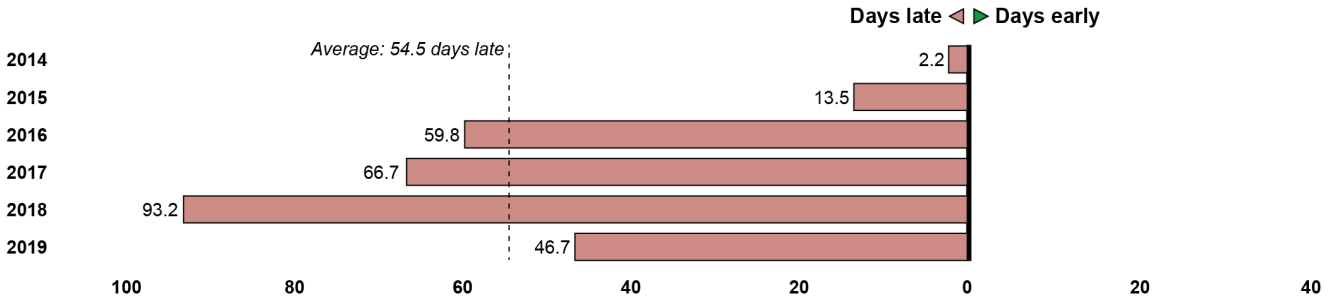


Source: GAO analysis of Navy data. | GAO-21-225T

In addition, our analysis of the maintenance timeliness data on a per aircraft basis shows similar trends (fig. 7). The Navy completed depot maintenance on average nearly 55 days late per aircraft. We recommended that the Navy use historical data to analyze turnaround time and establish accurate turnaround time targets for depot maintenance; the Navy concurred.

[43]GAO, *Military Depots: The Navy Needs Improved Planning to Address Persistent Aircraft Maintenance Delays While Air Force Maintenance Has Generally Been Timely,* GAO-20-390 (Washington, D.C.: June 23, 2020).

Figure 7: Average Number of Days Navy Aviation Depots Completed Selected Fixed-Wing Aircraft Maintenance Earlier or Later than Projected on a Per Aircraft Basis (Fiscal Years 2014 through 2019)

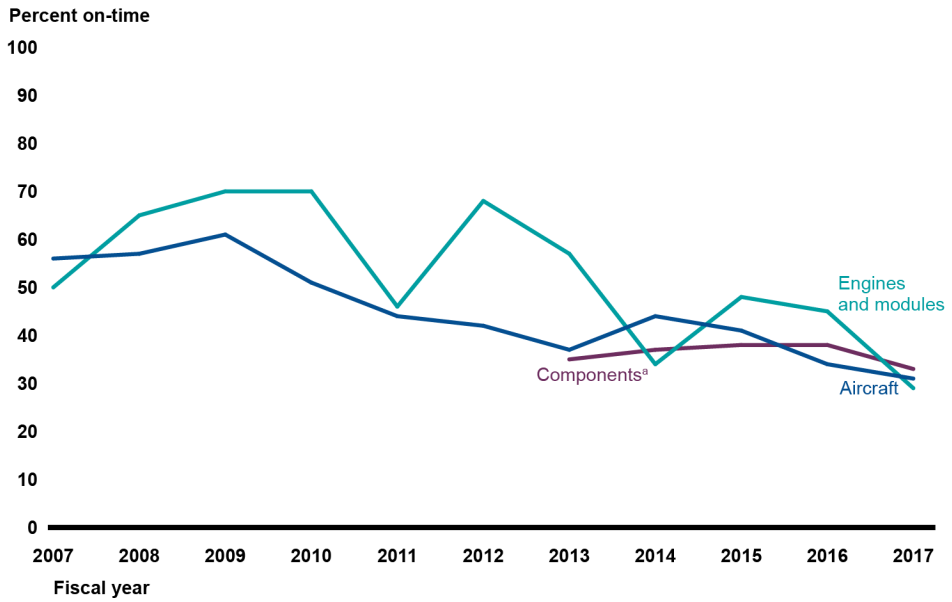


Source: GAO analysis of Navy data. | GAO-21-225T

We also reported in April 2019 that maintenance timeliness had declined not only for aircraft at the Fleet Readiness Centers between fiscal years 2007 and 2017, but also for engines and modules and components (see fig. 8).[44]

[44]GAO, *Military Depots: Actions Needed to Improve Poor Conditions of Facilities and Equipment that Affect Maintenance Timeliness and Efficiency*, GAO-19-242 (Washington, D.C.: April 29, 2019). Fleet Readiness Centers provide depot maintenance for Navy and Marine Corps rotary- and fixed-wing aircraft.

Figure 8: On-Time Performance at the Navy's Three Aviation Depots, Fiscal Years 2007 – 2017



Source: GAO analysis of performance data from the three Navy aviation depots. | GAO-21-225T

Note: A Navy official described components as any aircraft assembly or subassembly, such as valves, gearboxes, and rotor heads. Similarly, modules were described as major subassemblies of an engine that other locations can use to complete engine repairs. Navy aviation officials stated that they began tracking on-time performance of components in fiscal year 2013.

- **Poor condition of facilities and equipment at maintenance depots**. We have also found that facility and equipment condition can affect depot performance. Specifically, we reported in April 2019 that the condition of two of the three Fleet Readiness Centers—Fleet Readiness Center Southwest and Fleet Readiness Center Southeast—were rated as poor while the other—Fleet Readiness Center East—was rated as fair.[45] Additionally, each of the Fleet Readiness Centers relied on equipment that is, on average, past its expected useful life. As previously discussed, we recommended that the Navy track the extent to which facility or equipment conditions contribute to maintenance delays and the Navy agreed.
- **Maintenance and supply support challenges for aging aircraft.** Depot maintenance on aging weapon systems, including Navy and Marine Corps aircraft, becomes less predictable as structural fatigue occurs and parts that were not expected to be replaced begin to wear

[45]GAO-19-242.

out. While the Navy and the Marine Corps reported that sustainment funding accounts, such as those for depot maintenance and spare parts, have been funded at increased levels in fiscal years 2017-2020, efforts to improve spare parts availability take time to produce results, as a result of long lead times for acquiring some items. In addition, Navy and Marine Corps aircraft face challenges associated with diminishing manufacturing sources and parts obsolescence.[46] DOD has a program intended to manage these risks, but we reported in September 2017 that its implementation varied across DOD weapon system program offices.[47] We made recommendations to improve the program's management; DOD concurred and has initiated improvement efforts.

- **Inexperience and retention issues with depot maintenance personnel.** In December 2018, we reported that while the Fleet Readiness Centers were generally able to fill skilled occupations for fiscal years 2013-2017, they faced challenges in ensuring that their workforces had sufficient training and experience to perform current and planned depot maintenance activities.[48] For example, Fleet Readiness Center Southwest officials reported that challenges to maintaining critical skills in the depot workforce have contributed to maintenance delays. Specifically, these workforce challenges contributed to the Navy depots repairing only 18 out of a planned 31 F/A-18 A-D aircraft in fiscal year 2017. In addition, workforce inexperience and attrition were some of the reasons cited by a Navy report for defects detected in the landing gear for F/A-18, E-2, and C-2A aircraft.[49] As previously discussed, the Navy has undertaken actions to hire, train, and retain a skilled workforce at its depots, but we found that the Navy has not assessed the effectiveness of these actions. We recommended that the Navy assess the effectiveness of its efforts, and the Navy agreed and has identified planned actions.

[46]GAO-21-101SP and GAO-18-678.

[47]The Diminishing Manufacturing Sources and Material Shortages program is meant to address parts supply challenges. GAO, *Defense Supply Chain: DOD Needs Complete Information on Single Sources of Supply to Proactively Manage the Risks*, GAO-17-768 (Washington, D.C.: Sept. 28, 2017).

[48]GAO, *DOD Depot Workforce: Services Need to Assess the Effectiveness of Their Initiatives to Maintain Critical Skills*, GAO-19-51 (Washington, D.C.: Dec. 14, 2018).

[49]Commander Fleet Readiness Centers, *Fleet Readiness Center Southwest Landing and Arresting Gear Quality Escape Investigation Report* (May 11, 2017).

New F-35 Aircraft Face Sustainment and Operational Challenges

Sustainment challenges are not just an issue for older aircraft; they represent a significant challenge for the F-35 Lightning II aircraft—a key component in the future of tactical aviation for the Navy and Marine Corps. The Navy and Marine Corps are both flying F-35s now as the program ramps up production, and the two services plan to procure nearly 700 aircraft over the coming decades.

In August 2020, we reported that while the average mission capable rate for the F-35 Lightning II Joint Strike Fighter showed an increase from fiscal year 2012 to fiscal year 2019, it trended downward during fiscal years 2015 through 2018 before improving slightly in fiscal year 2019.[50] We testified in November 2019 and July 2020 on the sustainment challenges hindering the readiness of the F-35 fleet.[51] In particular, spare parts shortages throughout the F-35 supply chain are contributing to F-35 aircraft being unable to perform as many missions or to fly as often as the warfighter requires. In April 2019, we reported that:

- F-35C aircraft (including Navy aircraft) were *available* (i.e., the aircraft were safe to fly, available for use, and able to perform at least one tasked mission) 36 percent of the time from May 2018 through November 2018, which fell short of the 65-percent goal established by the Navy for non-deployed units. These aircraft were *fully mission capable* (i.e., the aircraft were capable of accomplishing all tasked missions) only about 2 percent of the time during the same period, falling well short of the Navy's 60-percent goal.
- F-35B aircraft (including Marine Corps aircraft) were *available* about 46 percent of the time from May 2018 through November 2018, which fell short of the Marine Corps 65-percent goal and were *fully mission*

[50]GAO-21-101SP.

[51]GAO, *Aircraft Sustainment: DOD Faces Challenges in Sustaining a Growing Fleet*, GAO-20-234T (Washington, D.C.: November 13, 2019) and GAO, *F-35 Sustainment: DOD Needs to Address Key Uncertainties as It Re-Designs the Aircraft's Logistics System*, GAO-20-665T (Washington, D.C.: July 22, 2020).

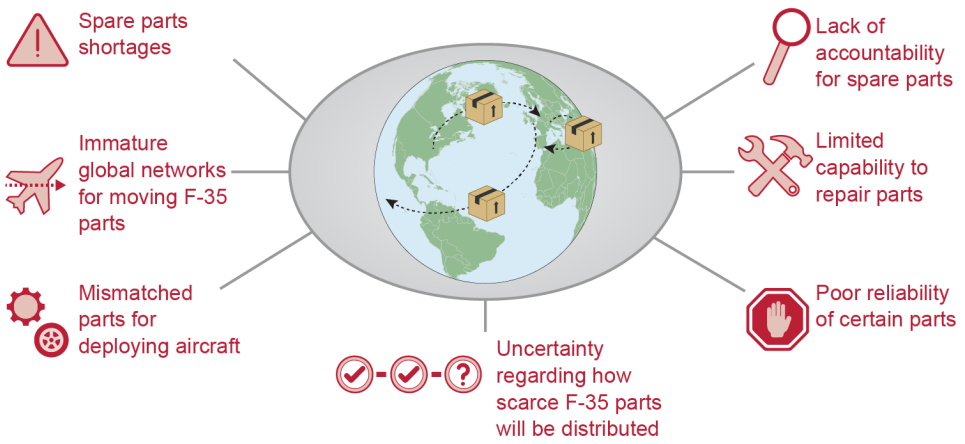
capable about 16 percent of the time, also falling well short of the 60-percent goal.[52]

We found that several factors contribute to the parts shortages, including that F-35 parts are breaking more often than expected and DOD has limited capability to repair parts when they break (see fig. 9).[53] DOD does not expect to have repair capabilities at its military depots ready until 2024, which is 8 years behind schedule. As a result, the average time taken to repair an F-35 part was more than twice as long as planned between September and November 2018, and a backlog of about 4,300 spare parts was awaiting repair at depots or manufacturers at that time. Furthermore, our work found that spare parts for deploying aircraft do not always match military service needs. DOD purchases certain sets of F-35 parts years ahead of time to support aircraft on deployments, but the parts do not fully match the military service's needs, because the F-35 aircraft have been modified over time. For example, 44 percent of purchased parts were incompatible with aircraft the Marine Corps took on a deployment in 2018.

[52]GAO, *Aircraft Sustainment: DOD Needs to Address Substantial Supply Chain Challenges*, GAO-19-321 (Washington, D.C.: April 25, 2019). The F-35C data include fewer than 30 fielded F-35C aircraft, and the Navy did not declare initial operational capability for this fleet until February 2019. DOD officials said that the Navy was prioritizing modifications to upgrade the capabilities of its F-35C aircraft as the service progressed toward a declaration of initial operational capability instead of pursuing efforts to maximize current aircraft availability and capability rates.

[53]We reported in April 2019 that the F-35 program was failing to meet four of its eight reliability and maintainability targets—which determine the likelihood that the aircraft will be in maintenance rather than available for operations—including metrics related to part removals and part failures. For additional information, see GAO, *F-35 Joint Strike Fighter: Action Needed to Improve Reliability and Prepare for Modernization Efforts*, GAO-19-341 (Washington, D.C.: April 29, 2019).

Figure 9: Selected F-35 Supply Chain Challenges



Source: GAO. | GAO-21-225T

Our work has shown that, as DOD has gained experience with the F-35, it has encountered additional challenges. In 2017, the Marine Corps became the first military service to station F-35 aircraft overseas, transferring aircraft to Iwakuni, Japan. While in the Pacific, DOD expects to disperse its F-35s into smaller detachments to outmaneuver the enemy and counter regional threats. However, as we reported in April 2018, this approach posed logistics and supply challenges.[54]

Additionally, DOD continues to grapple with the immaturity of the F-35's Autonomic Logistics Information System (ALIS), a complex information technology system that supports operations, mission planning, supply-chain management, maintenance, and other processes. It is intended to provide the necessary logistics tools to F-35 users as they operate and sustain the aircraft.

In March 2020, we reported that while DOD had made some improvements to ALIS, users continued to report significant challenges.[55] For example, users at all 5 locations we visited stated that electronic records of F-35 parts in ALIS are frequently incorrect, corrupt, or missing, resulting in the system signaling that an aircraft should be grounded in

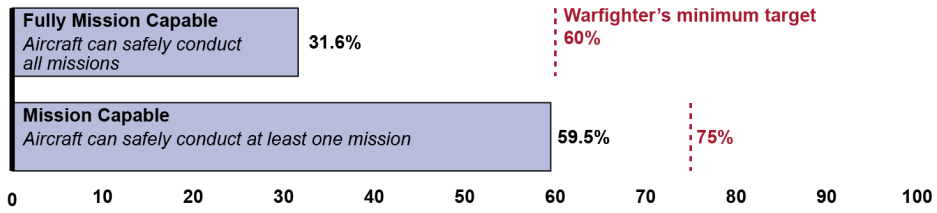
[54]GAO, *Warfighter Support: DOD Needs to Share F-35 Operational Lessons Across the Military Services*, GAO-18-464R (Washington, D.C.: Apr. 25, 2018). This was a public version of a more detailed March 2018 classified report.

[55]GAO, *Weapon System Sustainment: DOD Needs a Strategy for Re-Designing the F-35's Central Logistics System*, GAO-20-316 (Washington, D.C.: Mar. 6, 2020).

cases where personnel know that parts have been correctly installed and are safe for flight. At times, F-35 squadron leaders have decided to fly an aircraft when ALIS has signaled not to, thus assuming operational risk to meet mission requirements.

We also found that problems with ALIS could be affecting the overall readiness of the F-35 fleet, including the Navy and Marine Corps aircraft. Users at all five F-35 locations we visited also stated that problems with ALIS are affecting the overall readiness of the F-35 fleet; however, they were unable to tell us the degree to which this is the case. Overall F-35 fleet-wide performance has been falling short of warfighter requirements—that is, aircraft cannot perform as many missions or fly as often as required. Figure 10 shows F-35 fleet aircraft performance from October 2018 through September 2019. Full mission capability, or the percentage of time during which the aircraft can perform all of its tasked missions, was 31.6 percent across the fleet, as compared with the warfighter minimum target of 60 percent. Mission capability, or the percentage of time during which the aircraft can safely fly and perform at least one tasked mission, was 59.5 percent across the fleet, as compared with the warfighter minimum target of 75 percent.

Figure 10: F-35 Fleet Aircraft Performance, October 2018-September 2019



Source: GAO analysis of Department of Defense and Lockheed Martin information. | GAO-21-225T

DOD had not (1) developed a performance-measurement process for ALIS to define how the system should perform or (2) determined how ALIS issues were affecting overall F-35 fleet readiness, which remains below warfighter requirements. DOD recognizes that ALIS needs improvement and plans to leverage ongoing re-design efforts to eventually replace ALIS with a new logistics system that it has named the Operational Data Integrated Network (ODIN). However, DOD has not developed a strategy for the re-design of the F-35's logistics system that includes clearly identifying and assessing goals, key risks or uncertainties, and costs. We recommended in our March 2020 report that DOD develop such a strategy, and DOD concurred.

DOD's current F-35 sustainment challenges have largely resulted from insufficient planning. Our work has shown that planning for sustainment and aligning its funding are critical if DOD wants to meet its F-35 availability goals and effectively deploy to support operations. We have found that DOD lacks information about the technical characteristics and costs of the F-35, which will impair its ability to plan for the long-term sustainment of the F-35 fleet.[56] DOD's costs to purchase the F-35 are expected to exceed $428 billion, and the department expects to spend more than $1.2 trillion to sustain its F-35 fleet. As a result, as DOD takes action to increase the readiness of the F-35 fleet and improve its sustainment efforts, it must also deliver an aircraft that the military services can successfully operate and maintain over the long term within their budgetary realities. DOD's continued attention to our F-35 recommendations will be important as it balances readiness, sustainment, and affordability goals.

In sum, the Navy and Marine Corps continue to face significant readiness challenges that have developed over more than a decade of conflict, budget uncertainty, and reductions in force structure. The ongoing COVID-19 pandemic will further affect the ability of the Navy and Marine Corps to address the multiple readiness challenges we have discussed in this statement and to rebuild readiness. In response to the pandemic, the Navy and Marine Corps have extended operational deployments, curtailed training, and suffered impacts to their maintenance workforce and operations that will affect both current and future readiness. In addition, the military industrial base, which has an important role in maintaining surface ships and supplying spare parts, has also been affected by pandemic-related disruptions.

Further, in June 2020, we reported that COVID-19 has affected the Navy's and Marine Corps' ability to conduct work at its depots.[57] For example, reductions in operations at the Albany, Georgia and Barstow, California production plants—both Marine Corps depots—have decreased operating capacity to less than 20 percent. Navy and Marine Corps officials stated that slowed or stopped work due to COVID-19 will also affect the cash balance of the Navy and Marine Corps depots.

[56]GAO, *F-35 Aircraft Sustainment: DOD Needs to Address Challenges Affecting Readiness and Cost Transparency,* GAO-18-75 (Washington, D.C.: October 26, 2017).

[57]GAO, *COVID-19: Opportunities to Improve Federal Response and Recovery Efforts* GAO-20-625 (Washington, D.C.: June 25, 2020).

The CARES Act appropriated $475 million to the Navy Working Capital Fund to prevent, position, prepare for, and respond to the coronavirus, domestically or internationally. The Navy Working Capital Fund was below its lower cash requirement for most of fiscal year 2020, even after receiving the CARES Act appropriation. However, the fund's cash balance ended fiscal year 2020 at about $2.2 billion, which is above its lower cash requirement. This was achieved in part by transferring an additional $731 million from other DOD accounts into the Navy Working Capital Fund in September 2020, and other management actions that increased the fund's balance. We have ongoing work examining the impact of COVID-19 on Navy and Marine Corps depots and their associated working capital funds. We plan to report on the results of that work in early 2021.

We also have ongoing work examining the pandemic's effects on the Military Health System, including a review of DOD's force health protection efforts. Additionally, we plan to address the pandemic's readiness effects in our upcoming review assessing the readiness of DOD's major force elements in each of the warfighting domains.

The Navy's and Marine Corps' longstanding readiness challenges have been compounded by the effects of the pandemic and several debilitating accidents in recent years. Altogether, these challenges hinder the services from reaping the full benefit of their forces and keeping them in a higher state of readiness.

Both services have made encouraging progress in identifying the causes of their readiness declines and have begun efforts to arrest and reverse it. However, our work shows that fully addressing the persistent readiness challenges will require years of sustained management attention. Continued progress implementing our prior recommendations will bolster ongoing Navy and Marine Corps efforts to address these readiness challenges.

Chairman Sullivan, Ranking Member Kaine, and Members of the Subcommittee, this concludes my statement for the record.

GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this statement, please contact Diana Maurer, Director, Defense Capabilities and Management at (202) 512-9627 or maurerd@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this statement are Suzanne Wren (Assistant Director), Steven Banovac (Analyst in

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Related GAO Products

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