



April 2023

# NAVY SHIP FIRES

## Ongoing Efforts to Improve Safety Should Be Enhanced

Accessible Version

# GAO Highlights

Highlights of [GAO-23-105481](#), a report to congressional requesters

## Why GAO Did This Study

The Navy reported more than \$4 billion in estimated damages from fires that occurred onboard ships undergoing maintenance from May 2008 through December 2022. The Navy also lost two ships to fires during this period, including the USS *Bonhomme Richard*.

GAO was asked to review issues related to fires during maintenance. This report examines, among other things, the extent that the Navy has (1) addressed lessons learned from fires and developed a process to improve the collection, analysis, and sharing of lessons learned; (2) collected and analyzed data about the effects that fires during maintenance have on ships; and (3) assessed the effectiveness of training provided to personnel to implement fire-safety policies on ships during maintenance.

To conduct this work, GAO reviewed Navy documents, best practices, policies and procedures, fire-safety training materials, and Navy reports on fires from 2008-2020. GAO staff interviewed officials from Navy organizations responsible for fire safety, prevention, and response. GAO also visited ships undergoing maintenance at a naval base, and naval and private shipyards.

## What GAO Recommends

GAO is making three recommendations to the Navy, including that it establish a process for consistently collecting lessons learned; an organization to analyze the effects of fires; and service-wide goals, performance measures, and a process for monitoring and reporting progress for fire-safety training. In written comments, the Navy concurred with all three recommendations.

View [GAO-23-105481](#). For more information, contact Diana Maurer at (202) 512-9627 or [maurerd@gao.gov](mailto:maurerd@gao.gov).

April 2023

## NAVY SHIP FIRES

### Ongoing Efforts to Improve Safety Should Be Enhanced

## What GAO Found

U.S. Navy ships undergoing maintenance face a high risk of fire, in part because repairs can involve sparks or welding in confined areas with flammable material. Navy organizations collect and analyze lessons learned from fires through a number of processes. However, the Navy does not have a process for consistently collecting, analyzing, and sharing these lessons learned. As a result, the Navy has lost lessons learned over time—such as steps that a ship can take to improve fire safety. Organizations that GAO interviewed collected lessons learned from fires; however, they had not consistently used the approved Navy-wide system to store and share them. Establishing a process for the consistent collection, analysis, and sharing of fire-related lessons learned would assist the Navy to improve behavior and reduce the risk of ships repeating costly mistakes.

#### Fire aboard the USS *Bonhomme Richard* in San Diego, California, July 2020



Source: U.S. Navy/Lieutenant J. Mike. | GAO-23-105481

Although the Navy has begun improving the collection of data related to fires aboard ships during maintenance in the Navy's safety database, no organization is analyzing the broad effects of fires on the Navy's operations and strategic resources. Without conducting such analyses, the Navy will not have a complete picture of the magnitude of risks associated with ship fires. In addition, senior leaders and policymakers can use these analyses to inform their prioritization of resources for fire prevention and mitigation relative to other competing interests.

Navy organizations responsible for training have assessed the effectiveness of their individual training efforts in multiple ways—such as conducting course evaluations and fire drills. However, the Navy has not assessed the effectiveness of its collective training efforts service-wide. The Navy has not set service-wide goals, performance measures, and a process to monitor progress for its collective training efforts to improve fire safety and response. By establishing these practices service-wide, Navy leadership would have the information needed to determine the extent to which its training efforts are effective in reducing the incidence and severity of fires.

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#### Abbreviations

DOD	Department of Defense
NAVSEA	Naval Sea Systems Command

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April 20, 2023

Congressional Requesters

Navy ships undergoing maintenance face a great risk of fire as a result of the work being performed and the physical environment on the ship during maintenance.<sup>1</sup> Recent fire incidents have endangered lives, caused significant physical and financial damage, and affected the U.S. Navy's readiness by delaying maintenance and reducing the amount of time during which ships are available for operations and training.<sup>2</sup> According to the Navy, there was more than \$4 billion in estimated total damage from 15 major fire incidents that occurred from May 2008 through July 2020.<sup>3</sup> Further, according to our review of Navy documentation, multiple personnel suffered from injuries, although no deaths were reported from these fire incidents.

One of the most significant fire incidents in the Navy's history occurred on July 12, 2020, when a major fire started in the lower vehicle storage compartment onboard the USS *Bonhomme Richard*, an amphibious

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<sup>1</sup>The risks to ships undergoing maintenance include: "hot-work activities" that create sparks, which have led to fire incidents; disconnected fire-suppression systems during maintenance, which have delayed or hindered firefighting efforts after a fire has begun; and maintenance-related debris, equipment, and scaffolding that can serve as kindling and complicate access to fighting a fire. Hot work is defined as flame heating, welding, torch cutting, brazing, carbon-arc gouging, and other operations that produce heat, by any means, of 400°F or more.

<sup>2</sup>For the purposes of this report, we use the term "fire incidents" to mean any fire—major and minor—that occurred aboard a ship. We use the term "ship" in this report to refer to a submarine, aircraft carrier, or surface ship undergoing maintenance. We did not include fire incidents that occurred on ships at sea as part of our scope for this review.

<sup>3</sup>This estimate does not fully reflect the complete loss of two ships during this time period. Thirteen of the 15 fire incidents occurred while the ships were docked pier-side undergoing maintenance or conducting some other activities. Following the major fire incidents aboard the USS *Miami*, a Los Angeles-class attack submarine, and the USS *Bonhomme Richard*, a multi-purpose Wasp-class amphibious assault ship, the Navy decommissioned both ships. Since the fire aboard the USS *Bonhomme Richard* in July 2020, the Navy has incurred at least \$669,000 in damages from additional fire incidents during maintenance periods through December 2022, according to data from the Naval Safety Command.

assault ship.<sup>4</sup> The fire burned for several days, spread to 11 of 14 decks, and reached temperatures in excess of 1,400 degrees Fahrenheit. When it caught fire, the ship was in the process of receiving upgrades worth \$250 million that would have allowed the ship to deploy with F-35B aircraft. The fire resulted in over \$3 billion in damages. Rather than pay the high cost for repairs, the Navy decommissioned the ship.

Figure 1 shows some of the physical damage that the USS *Bonhomme Richard* sustained in July 2020 and related firefighting efforts.

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<sup>4</sup>The Navy defines a major fire as a fire that has progressed beyond the initial stage, beyond the ability of the initial responders (usually the ship's force on ships in commission) to control, and is still not under control when the first fire hose team outfitted in self-contained breathing apparatuses and fire-fighting ensembles needs to be relieved. A multilevel fire (a fire that spreads beyond one level of a ship) is a major fire. Naval Sea Systems Command, Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021). We refer to this manual throughout the report as the "8010 Manual."

Figure 1: Images of the Major Fire aboard the USS *Bonhomme Richard*



Source: U.S. Navy/Petty Officer 3rd Class M. A. D. Tramble (top); U.S. Navy/Petty Officer 3rd Class H. Cerrera (bottom). | GAO-23-105481

You requested that we review the Navy's response to fire incidents aboard Navy ships as they undergo maintenance or modernization and to review the effects of the fires. This report examines (1) the extent to

which the Navy has addressed lessons learned from fire incidents on ships undergoing maintenance and developed a process to improve the consistent collection, analysis, and sharing of lessons learned;<sup>5</sup> (2) the extent to which the Navy has collected and analyzed data about the effects of fire incidents; (3) what steps the Navy has taken to manage personnel levels on ships to respond to the risk of fire incidents during maintenance; and (4) the extent to which the Navy has provided and assessed training to personnel to implement its fire-safety policies when aboard ships undergoing maintenance.

To address all four objectives, we reviewed Navy documents, including fire safety-related lessons learned, fire-safety policies and procedures, damage control and fire-safety training materials, and fire-review reports.<sup>6</sup> We also interviewed Navy officials and contractors, including from the Office of the Chief of Naval Operations, Naval Sea Systems Command (NAVSEA), the Naval Safety Command, U.S. Fleet Forces Command, and U.S. Pacific Fleet, as well as officials at naval and private shipyards. For detailed information on our scope and methodology, see appendix I.

We conducted this performance audit from November 2021 to April 2023 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

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<sup>5</sup>For the purposes of this report, we use the term “lessons learned” to include best practices, corrective actions, action items, and recommendations.

<sup>6</sup>Damage control represents the measures that are necessary aboard the ship to contain, preserve, and reestablish watertight integrity, stability, maneuverability, and combat systems. Naval Sea Systems Command, *Naval Ships’ Technical Manual, Chapter 079, Damage Control Volume 2, Practical Damage Control* (Dec. 15, 2008).



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## Overview of Major Ship Fires since 2012

On May 23, 2012, a major fire occurred on the submarine USS *Miami* at Portsmouth Naval Shipyard in Kittery, Maine. The fire caused significant damage to the forward compartment of the submarine, which resulted in more than \$700 million in estimated damages. Rather than pay the high cost to repair the damages, the Navy decommissioned the ship 10 years ahead of schedule. After the loss of the USS *Miami*, the Navy realized that it could not afford another setback from a fire of this magnitude. Navy officials recognized a need to raise the Navy's standards and capabilities to improve fire safety, and to develop cost-effective solutions to improve fire prevention and detection, immediate response, and extended response for ships undergoing maintenance.

Even though the Navy took steps to raise standards and capabilities to improve fire safety following the USS *Miami* fire in 2012, the Navy experienced nine additional major fires aboard ships undergoing maintenance over the next 10 years. Figure 2 highlights 10 major fires that occurred aboard Navy vessels from 2012 through 2022. For example, in 2015, a fire aboard the USS *Gunston Hall*<sup>7</sup> at the NASSCO-Earl Shipyard in Portsmouth, Virginia, resulted in an estimated \$26 million in repairs and extended the vessel's maintenance period by 2 months.<sup>8</sup> Further, in 2018, a fire aboard the USS *Oscar Austin* at the BAE Systems shipyard in Norfolk, Virginia, resulted in an estimated \$75 million in damages, according to Navy officials.<sup>9</sup>

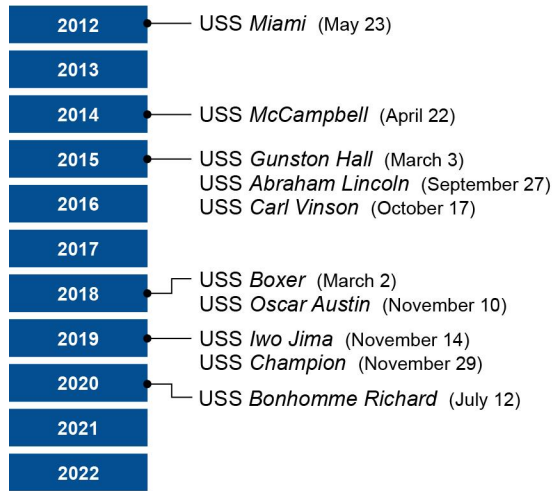
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<sup>7</sup>The USS *Gunston Hall* is a Whidbey Island-class dock landing ship.

<sup>8</sup>For the purposes of this report, we will use the term "maintenance period" to mean maintenance availability. A maintenance availability is any maintenance or modernization period where industrial work (such as maintenance, repair, modernization, inactivation, recycling, disposal, or construction) is being performed. Naval Sea Systems Command, Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021).

<sup>9</sup>The USS *Oscar Austin* is an Arleigh Burke-class destroyer ship.

**Figure 2: Timeline of Major Fires aboard Navy Ships Undergoing Maintenance from 2012 through 2022**



Source: GAO presentation of U.S. Navy information. | GAO-23-105481

**Text of Figure 2: Timeline of Major Fires aboard Navy Ships Undergoing Maintenance from 2012 through 2022**

- Year 2021: USS *Miami* (May 23)
- Year 2014: USS *McCampbell* (April 22)
- Year 2015:
  - USS *Gunston Hall* (March 3)
  - USS *Abraham Lincoln* (September 27)
  - USS *Carl Vinson* (October 17)
- Year 2018:
  - USS *Boxer* (March 2)
  - USS *Oscar Austin* (November 10)
- Year 2019:
  - USS *Iwo Jima* (November 14)
  - USS *Champion* (November 29)
- Year 2020: USS *Bonhomme Richard* (July 12)

Source: GAO presentation of U.S. Navy information. | GAO-23-105481

Note: The Navy defines a major fire as a fire that has progressed beyond the initial stage, beyond the ability of the initial responders (usually the ship's force on ships in commission) to control, and is still not under control when the first fire hose team outfitted in self-contained breathing apparatuses and fire-fighting ensembles needs to be relieved. A multilevel fire (a fire that spreads beyond one level of

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a ship) is considered to be a major fire. Naval Sea Systems Command Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021).

Following the USS *Bonhomme Richard* fire in July 2020, the Navy conducted a comprehensive review of 15 major fires that occurred from 2008 through 2020. This comprehensive review, known as the *Major Fires Review*, identified 12 significant issues and made 56 corrective actions and recommendations to improve fire safety across the Navy. Specifically, the *Major Fires Review* identified the following, among other things:

- A lack of appreciation for the hazards associated with significant transitions, especially during maintenance periods, and insufficient management of the associated risk;
- Declining standards in watch standing and a failure to critically assess and address deficiencies in a timely and effective manner; and,
- Ineffective day-to-day training and a lack of comprehensive integrated drill sets.

The review team recommended that the Navy take some broad actions, such as:

- improve the reporting of near-miss incidents and share lessons learned across the surface force;
- improve Naval Safety Command and fleet and force headquarters safety programs and data analysis to provide predictive operational safety and risk information;
- improve processes that support learning across the Navy (i.e., between warfare communities); and,
- make improvements in damage control.

For more information about this review and the corrective actions the Navy has taken, see appendix II.

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## Navy's Process for Fire Investigations

According to Navy guidance, any unintentional fires occurring on any naval installation (including shipyards), ship, or submarine are considered

“reportable fires” that must be reported.<sup>10</sup> Following a major fire and other significant incidents, the Navy conducts three types of investigations.

- Safety investigations. Commands that are responsible for providing oversight for subordinate units and enforcement of safety reporting appoint a safety investigation board to conduct investigations for fire incidents that meet certain criteria. Such fire incidents include those that involve personal injury, loss of life, or reach an established monetary threshold. These investigations are used to determine the root cause of the fire incident, produce lessons learned, and develop corrective actions.<sup>11</sup>
- Command investigations. According to Navy officials, commands conduct investigations for fire incidents involving personal injury or loss of life to identify causal factors of the fire or incident, as well as associated corrective actions.
- Criminal investigations. The Naval Criminal Investigative Service has primary responsibility for investigating fires of unknown origin affecting Navy property.<sup>12</sup> According to Navy officials, law enforcement agencies, such as the Naval Criminal Investigative Service, conduct criminal investigations to determine if any illegal activity, such as arson in the case of a fire, was the cause of the incident.<sup>13</sup>

In addition, according to Navy officials, NAVSEA sends experts to assess the effect of a major fire on a ship, including cost estimates to repair the damage. A Navy official stated that the chief engineer at NAVSEA may also convene a Failure Review Board for each independent incident to determine whether a design or engineering problem contributed to the

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<sup>10</sup>These fires include small fires in which no personnel were injured and the material property damage was limited to the originally ignited materiel and not propagated to other materials. Evidence of previously unreported combustion or explosion must also be reported upon discovery. Office of the Chief of Naval Operations Manual 5102.1, Marine Corps Order 5100.29C, vol. 9, *Navy and Marine Corps Safety Investigation and Reporting Manual* (Sept. 27, 2021).

<sup>11</sup>A safety investigation board is a formal investigating body that is typically appointed by the controlling command to determine the factors that caused the fire incident. OPNAV M-5102.1, MCO 5100.29C, vol. 9.

<sup>12</sup>Secretary of the Navy Instruction 5430.107A, *Mission and Functions of the Naval Criminal Investigative Service* (June 19, 2019).

<sup>13</sup>Navy officials told us that the Bureau of Alcohol, Tobacco, Firearms and Explosives and Judge Advocate General officers may also participate in criminal investigations related to ship fires.

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incident or could have contributed to a much larger incident under different circumstances.

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## Navy's Fire-Safety Policies and Training

The Navy has issued fire-safety policies that include guidance on specific fire-safety and response procedures, firefighting training, and other processes. A number of policies are summarized below.

### **Industrial Ship Safety Manual for Fire Prevention and Response.**

Known as the 8010 Manual by Navy officials, this guidance was released in February 2014 in response to the USS *Miami* fire.<sup>14</sup> The purpose of this manual is to provide a single-source document that specifies the requirements for the prevention of, detection of, and response to fires aboard Navy ships undergoing industrial work to ensure safety of personnel and equipment. For example, it specifies what should be included in a fire-safety plan, establishes training and qualification requirements for fire safety officers and fire safety watches, and provides information on fire-protection systems.<sup>15</sup>

The 8010 Manual also outlines the requirements for shipboard fire drills and major fire drills. It applies to ship repair, construction activities, and maintenance at public shipyards, private repair shipyards, regional maintenance centers, fleet maintenance activities, and new construction ships as invoked in the shipbuilding contracts.<sup>16</sup>

**Naval Ships' Technical Manual.** The Naval Ships' Technical Manual, Chapter 555, Volume 1, *Surface Ship Firefighting* and Volume 2, *Submarine Firefighting*, provide information on fire dynamics, fire hazards, fire response tactics, as well as firefighting equipment and

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<sup>14</sup>Since 2014, the 8010 Manual has been revised, most recently in 2021. Naval Sea Systems Command Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021).

<sup>15</sup>A fire safety watch is the person responsible for monitoring day-to-day fire-safety conditions and initiates response actions in the event of a fire.

<sup>16</sup>The Commander, Navy Regional Maintenance Centers, oversees the Navy's regional maintenance centers and detachment sites in their execution of surface ship maintenance and modernization, with a primary focus to provide combat-ready ships to execute their respective missions.

procedures for all surface ships and submarines. According to Navy officials, this manual informs firefighter training, policy, and procedures.<sup>17</sup>

**NAVSEA Standard Items.** NAVSEA maintains a list of “standard items” for inclusion in its contracts for ship maintenance. When incorporated, these items establish uniform requirements for contracted maintenance work. A contractor is typically required to implement only those standard items incorporated in the maintenance contract. These items may describe standards the work must meet rather than specify how the maintenance work must be accomplished. The Navy may be required to pay more later for requirements added through a change to the terms of the maintenance contract after award.

**Reporting guidance.** The Navy and Marine Corps Safety Investigation and Reporting Manual sets forth procedures for incident notification and safety investigation reporting and record keeping.<sup>18</sup> This guidance, which is applicable to all Navy and Marine Corps commands, activities, units, installations and facilities, defines what a reportable fire is, explains how incidents are classified, and outlines the reporting responsibilities for a safety investigation board.<sup>19</sup>

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## Navy’s Organizational Structure for Fire Safety, Prevention, and Response

A number of Navy organizations and commands share responsibilities for providing fire safety, prevention, and response in areas such as oversight, training, and assistance for ships undergoing maintenance. Figure 3 shows a chart of these key organizations and commands that extend across the Navy enterprise.

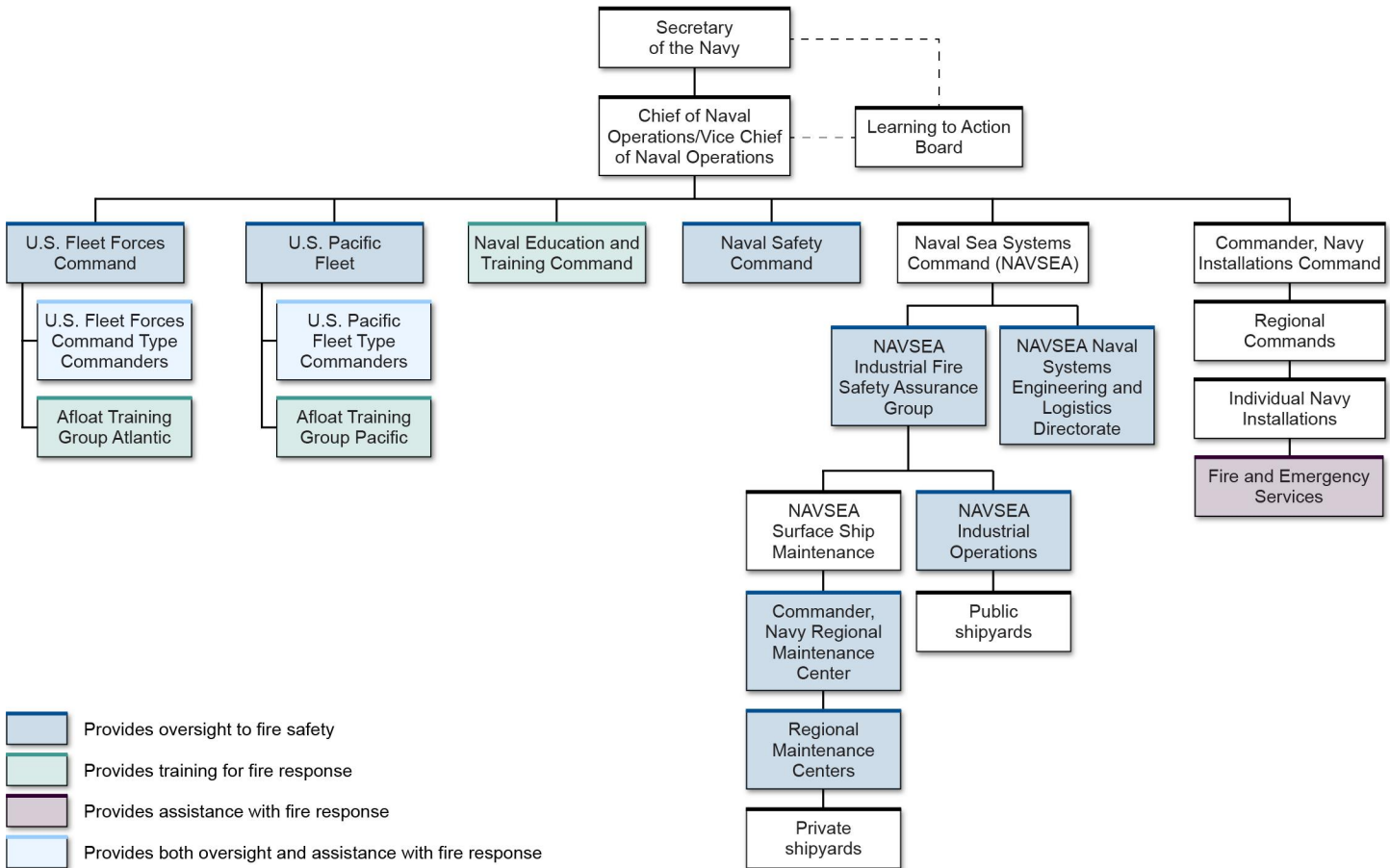
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<sup>17</sup>Naval Sea Systems Command, Naval Ships’ Technical Manual, Chapter 555, Volume 1, *Surface Ship Firefighting* (Aug. 15, 2017), and Naval Sea Systems Command, Naval Ships’ Technical Manual, Chapter 555, Volume 2, *Submarine Firefighting* (July 1, 2019).

<sup>18</sup>OPNAV M-5102.1, MCO 5100.29C, vol. 9.

<sup>19</sup>Additional fire-reporting requirements are set forth in Office of the Chief of Naval Operations Instruction 3100.6K, *Special Incident Reporting* (Aug. 10, 2021). This instruction directs Navy personnel to report certain types of incidents. These incidents are related to a wide-range of specific issues, including incidents involving nuclear weapons, sexual assault, extremist groups, or suicide. According to a Navy official, the special incident reporting serves as a notification and does not collect data the Navy can use to observe trends.

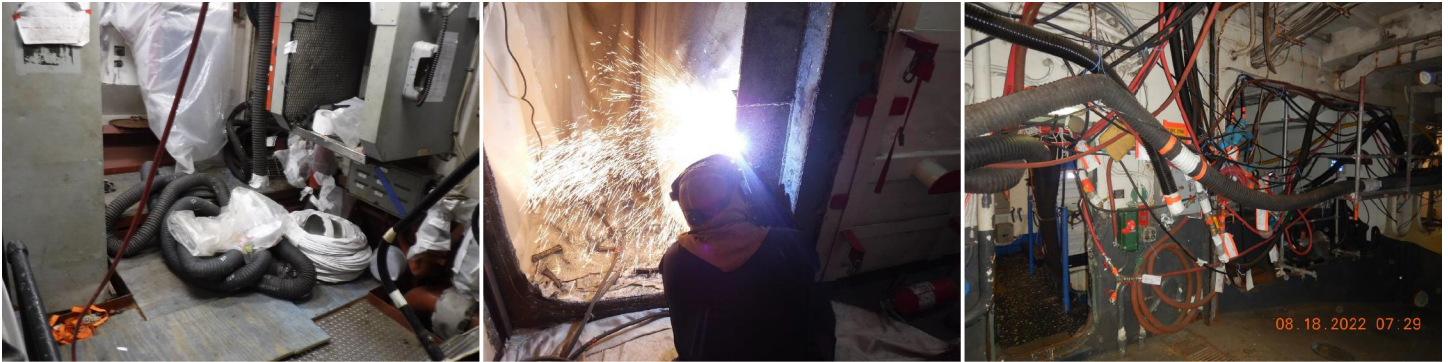
**Figure 3: Key Navy Organizations with Fire-Safety Roles and Responsibilities for Ships Undergoing Maintenance**



Source: GAO analysis of Navy information. | GAO-23-105481

At the unit level, fire safety officers conduct daily safety inspections aboard ships undergoing maintenance to ensure that Navy personnel and contractors conducting the work are in compliance with fire-safety policies and procedures. These safety inspections include the examination of temporary services, housekeeping (i.e., removal or reduction of combustible materials), maintenance of access and egress routes, and oversight of in-process hot-work operations. Each day, a minimum of two safety inspections are conducted: one in the morning and one in the afternoon, according to regional maintenance center officials. In addition, the officials stated that the fire safety officer provides the ship's force a summary of any noted deficiencies found during the safety inspections. Figure 4 shows examples of fire hazards during maintenance on ships.

**Figure 4: Fire Risks aboard Ships Undergoing Maintenance**



Source: U.S. Navy officials. | GAO-23-105481

Note: From left to right, photos depict hazards of debris, hot work, and unsecured wiring.

For more details about some of the key organizations and commands that are responsible for fire safety in the Navy, see appendix III.

## Navy Does Not Have a Process to Consistently Collect, Analyze, and Share Fire-Incident Lessons Learned

The Joint Lessons Learned Information System is the Navy's system of record for documenting and sharing lessons learned.<sup>20</sup> The Navy Warfare Development Command is the program director for the Navy's lessons learned program.<sup>21</sup> In July 2022, the command released a manual that supplements the Navy Lessons Learned Program guidance that the Navy issued in 2018.<sup>22</sup> According to the Navy Lessons Learned Program Manual, commanders provide guidance and establish a process to use the Joint Lessons Learned Information System in their organizations. The Joint Lessons Learned Information System aids in information sharing, planning future operations and exercises, updating fleet training and doctrine, and identifying capability gaps when used consistently.

<sup>20</sup>Office of the Chief of Naval Operations Instruction 3500.37D, *Navy Lessons Learned Program* (June 20, 2018).

<sup>21</sup>In October 2022, the Navy Warfare Development Command's name was officially changed to the Navy Warfare Development Center.

<sup>22</sup>Navy Warfare Development Command, *Navy Lessons Learned Program Manual* (July 1, 2022).



However, we found that the Joint Lessons Learned Information System has limited information that Navy organizations have learned from fire incidents on ships undergoing maintenance. Officials from the Navy Warfare Development Command stated that they have limited access to fire-related lessons learned from shipyards because the information may contain personal identifying information or privileged safety incident information. According to Navy officials, the command is not authorized to redact personal identifying information from command investigation reports or privileged safety information from safety investigation reports. The Naval Safety Command can redact this personal identifying information from safety investigation reports; however, time taken to remove this information from the reports delays the availability of useful lessons learned.

In addition, we found that organizations have not consistently used the Navy's system of record for lessons learned to collect and share fire-related lessons learned and best practices. The U.S. Fleet Forces Command officials told us that they maintain the fleet's lessons learned in the Joint Lessons Learned Information System, but U.S. Pacific Fleet officials stated that they have not yet required their type commanders to maintain the fleet's lessons learned in the Joint Lessons Learned Information System.<sup>23</sup>

Further, Navy organizations use processes that inconsistently collect, maintain, and share fire safety-related and damage control lessons and best practices to improve fire safety on ships undergoing maintenance. For example, regional maintenance center officials stated that they collect lessons learned and best practices via fire drill after-action reports, emails, and a knowledge-sharing network, as appropriate. These lessons are shared in biweekly meetings with the fire safety council and are provided to the Commander, Navy Regional Maintenance Center for

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<sup>23</sup>As this report was in its final processing, the Commanders for the U.S. Pacific Fleet, U.S. Fleet Forces Command, and U.S. Naval Forces Europe-Africa issued a comprehensive instruction for fleet safety management. This instruction requires the designation of lessons learned improvement managers to lead the review, validation, and processing of submissions to the Navy's subset of the Joint Lessons Learned Information System, and directs safety officers to use all tools available, including the system, to effectively communicate lessons learned. However, it does not explicitly require consistent use of the Joint Lessons Learned Information System for collecting, analyzing, and sharing lessons learned from fire incidents. Commander, U.S. Pacific Fleet, Commander, U.S. Fleet Forces Command, and Commander, U.S. Naval Forces Europe-Africa Instruction 5100.9A, *Fleet Safety Management System* (Dec. 21, 2022).

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review.<sup>24</sup> Officials from Submarine Force, U.S. Pacific Fleet stated that they send lessons learned via email to all submarine forces and place lessons learned material on a searchable lessons learned website owned by Submarine Force Atlantic.

**Example of a Fire-Related Lesson Learned**

One of the lessons that U.S. Submarine Force Pacific learned after a fire started on one of its submarines was that firefighting efforts were complicated due to an uncovered hole in the deck and inadequate shipyard fire main pressure. In addition, smoke boundaries were not established. Corrective actions to address these lessons included assessing the ship for other hazards similar to the uncovered hole and training crew on the use of smoke curtains and establishing smoke barriers.

Source: GAO analysis of Navy information. | GAO-23-105481

In addition, ships collect lessons learned via fire drills, fire-safety training sessions, safety walk-throughs, and no-notice assessments. According to ship officials, the outcomes of a fire drill are written in a report and automatically shared with partner activities, as well as shared during informal conversations that occur between and among the shipyards and the ship's force.

In our prior work, we identified eight key practices for applying a lessons learned process.<sup>25</sup> When applied, these practices provide a systematic means for agencies to learn from an event and make decisions about when and how to use that knowledge to change behavior. Among these practices, agencies should collect information, analyze the information, and share those lessons.

The Navy does not have a consistent lessons learned process because it has not ensured that all organizations use the Joint Lessons Learned Information System to collect, analyze, and share fire safety-related lessons learned. Navy officials told us that the Joint Lessons Learned Information System is a useful tool, but operational fire safety-related lessons learned may not need to be shared more broadly because such lessons may be applicable only to one ship. One of the most significant issues identified in the *Major Fires Review* in July 2021 was that lessons learned were not effectively being collected and were lost over time due to an ineffective and inconsistent process to collect, analyze, and share critical information and corrective actions. The review recommended improvements for capturing fire-safety lessons learned; however, we found that the Navy continues to use inconsistent processes for capturing

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<sup>24</sup>The 8010 Manual directs the creation of a fire safety council made up of representatives from personnel assigned to the ship, as well as fire-safety and maintenance organizations, to ensure compliance with fire-safety policies prescribed in the manual by making decisions at the local level regarding maintenance work and fire-safety systems, among other things.

<sup>25</sup>Office of the Chief of Naval Operations Instruction 3500.37D, *Navy Lessons Learned Program* (June 20, 2018), and GAO, *Federal Real Property Security: Interagency Security Committee Should Implement a Lessons-Learned Process*, [GAO-12-901](#) (Washington, D.C.: Sept. 10, 2012).

lessons learned. Additionally, the *Major Fires Review* found that ineffective and inconsistent processes for collecting and sharing lessons learned contributed to a significant gap in learning, adapting, and preventing future fire incidents.

During our review, the Learning to Action Board has been overseeing the Navy's revisions to its lessons learned policy and guidance for the Navy Lessons Learned Program and the Joint Lessons Learned Information System in response to the *Major Fires Review*, according to Navy officials.<sup>26</sup> However, the Navy has not issued guidance specifically requiring its organizations to use its lessons learned system of record or any other system to allow consistent collection, analysis, and sharing of fire-safety lessons learned.<sup>27</sup> In addition, neither the Navy's instruction for its Lessons Learned Program, nor any other fire-safety-specific guidance clearly specify the process for how collecting, analyzing, and sharing fire-safety lessons learned should be captured in the database.

Providing guidance requiring a process for the consistent collection, analysis, and sharing of fire-safety lessons learned would help ensure the Navy consistently identifies, maintains, and disseminates lessons learned. By improving the lessons learned process, the Navy could reduce the risk of ships repeating costly mistakes and make decisions about when and how to use that knowledge to change behavior.

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<sup>26</sup>The Navy established the Learning to Action Board in November 2021 as an oversight body to drive transparency and accountability for implementing and assessing approved recommendations from reviews, investigations, reports, and studies. More information about the Learning to Action Board is provided in Appendix III.

<sup>27</sup>The Navy's July 2022 *Lessons Learned Program Manual* provides detailed information on how to establish and operate a lessons learned program. However, it does not require organizations to use the system of record—the Joint Lessons Learned Information System—to collect, analyze, and share lessons learned.

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## Navy Has Improved Collection of Fire-Incident Data, but Has Not Analyzed the Broad Effects of Fires

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### Fire Incidents Have Been Underreported, but the Navy Has Taken Action to Improve Data Collection

The Naval Safety Command uses the Risk Management Information system to collect safety incident data, including data on fire incidents, for the Navy.<sup>28</sup> Since August 2020, Navy personnel are required to report ship fire incidents through this system.<sup>29</sup> Data from the Naval Safety Command shows that from May 2012 through September 2022, the Navy experienced more than 1,100 ship-fire incidents that ranged in severity from only smoke to a major fire.<sup>30</sup>

According to Navy guidance, any unintentional fire that occurs on a naval installation (including shipyards and industrial operations), ship, or submarine are to be reported via the Risk Management Information system.<sup>31</sup> Personnel are required to report even small fires in which no personnel were injured and the material property damage was limited to the originally ignited materiel and did not spread to other materials. Personnel almost always report major fires given the severity of the event, but other fire incidents during maintenance are not always reported. For example, according to Navy officials, many of the fires aboard ships are small and are extinguished immediately by the ship's force. Navy officials stated that the underreporting has given the Navy a

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<sup>28</sup>Since August 2020, the Naval Safety Command has used the Risk Management Information system to collect fire incident and safety data from other Navy stakeholders. Prior to that date, the Navy used a different system—the Web-Enabled Safety System—to collect this information.

<sup>29</sup>OPNAV M-5102.1, MCO 5100.29C, vol. 9.

<sup>30</sup>This data was drawn from both the Web-Enabled Safety System—for data from May 2012 to August 2020—and the Risk Management Information system—for data from August 2020 through September 2022. However, according to Navy officials, the number of ship fire incidents that were reported to the Naval Safety Command from May 2012 through September 2022 may not be an accurate count due to underreporting. In addition, ship-fire incidents that were reported during this period include incidents that occurred at-sea.

<sup>31</sup>OPNAV M-5102.1, MCO 5100.29C, vol. 9.

false sense of security with fire incidents and an incomplete picture of the true extent of the problem.

In fiscal year 2019, the Naval Safety Command conducted a study which found that approximately 92 percent of all fire incidents that occurred in-port in 2017 and 2018 were not reported in the Navy's reporting system of record.<sup>32</sup> In conducting its study, the safety command had to generate fire-incident reports from multiple reporting systems. Specifically, the safety command pulled data from trouble reports,<sup>33</sup> the National Fire Incident Reporting System, and self-reporting data generated by NAVSEA.<sup>34</sup>

Moreover, according to the study, none of the systems that the Naval Safety Command used to generate the fire-safety reports were compatible with the reporting system of record in use at that time, and fire reports were incomplete.<sup>35</sup> Both issues prevented the Naval Safety Command from collecting the data in full. In addition, the study showed that near-miss data was not being reported.<sup>36</sup> Further, fire-incident reporting is still lagging, incomplete, and inconsistent because everyone

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<sup>32</sup>The Naval Safety Command maintains and oversees the Department of the Navy's online reporting system and is responsible for developing and issuing Navy safety policies and guidance. In addition, as the National Fire Incident Reporting System Program Manager, the safety command provides fire incident summary data.

<sup>33</sup>Trouble reports are prepared when significant and systemic problems are encountered during ship construction, repair, alteration, maintenance, inactivation, and disposal. Trouble reports must describe what happened, how the event was discovered, and identify and evaluate the problem and cause. Naval Sea Systems Command Instruction 4700.17C *Preparation and Submission of Trouble Reports* (Feb. 1, 2022).

<sup>34</sup>The National Fire Incident Reporting System is a reporting standard that fire departments use to uniformly report on the full range of their activities, from fire to emergency medical services, as well as severe weather and natural disasters. The reporting system software is available at no cost to all states, including the District of Columbia, tribal and territorial agencies, and fire departments. The National Fire Incident Reporting System is the world's largest, national, annual database of fire-incident information.

<sup>35</sup>The Web-Enabled Safety System was used to collect this information prior to August 2020.

<sup>36</sup>Near-miss events are those events that, under slightly different circumstances, would have resulted in personal harm, property damage, or an undesired loss of resources. Department of Defense Instruction 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping* (June 6, 2011) (incorporating change 1, Aug. 31, 2018).

uses their own reporting systems, according to a Naval Safety Command official.

The causes of underreporting include personnel performing the maintenance work on ships not being properly trained on the safety requirements (e.g., when to report a fire), inconsistencies in which fire incidents need to be reported, and a culture among Navy personnel that did not encourage full compliance with reporting requirements. Figure 5 shows examples of charring we observed while touring a Navy ship. According to Navy officials, maintenance hot work caused this charring and the personnel performing this work did not report the incidents as required.

**Figure 5: Damage from Two Unreported Hot-Work Incidents**



Source: GAO. | GAO-23-105481

Note: The 8010 Manual requires maintenance personnel to notify the ship in advance of hot work as incidents involving hot work can lead to fires.

The Naval Safety Command's study found that ships and commands use different reporting systems instead of the safety command's system of record for collecting fire-incident data and the Naval Safety Command recommended that a single reporting policy be enforced. During our review, we also found that some Navy organizations use other systems to report fire-incident data. For example, officials from the Portsmouth Naval

Shipyard stated that they report federal fire incidents in the National Fire Incident Reporting System, as well as use NAVSEA's instruction for preparing and submitting trouble reports about fire incidents.

In addition, officials from the Hawaii Regional Maintenance Center stated that they use the Consolidated Surveillance System to share fire-incident data with NAVSEA, but the data are not directly shared with the Naval Safety Command. A Naval Safety Command official stated that if the reporting of safety incidents were consolidated into a single system, it would be easier to raise awareness of hazards, and would allow the application of effective mitigation and corrective efforts.

Another contributing factor to underreporting in the Risk Management Information system is that those who use the system say that it takes too long to enter the data. For example, Navy officials who generate fire reports in the Risk Management Information system stated that the system is slow to respond and upload pages. In addition, the system has not been accompanied with the necessary training for all personnel and is cumbersome to use, according to weekly feedback from users to the Naval Safety Command. For example, regional maintenance center officials stated that the Risk Management Information system is ineffective because it can take 2 to 4 hours to enter a single incident report into the system.

The Naval Safety Command has been working with other Navy entities to ensure that other reporting systems are not being used to collect fire and other safety incidents in lieu of the Risk Management Information system. NAVSEA's Industrial Fire Safety Assurance Group has met with leadership throughout NAVSEA and at other commands—like the Commander, Navy Installation Command—to explain the importance of reporting fire incidents in the Risk Management Information system, according to NAVSEA officials.

Additionally, with assistance from NAVSEA's Industrial Fire Safety Assurance Group, the Naval Safety Command is in the process of updating the Risk Management Information system to make it less arduous and easier for fleet users to enter fire-incident data. According to Naval Safety Command officials, they plan to continue updating the system's software every 3 weeks to make it easier for users to use the data system. In addition, according to Navy officials, NAVSEA's Industrial Fire Safety Assurance Group is engaging with the Naval Safety Command to develop an easier process to report small or near-miss fire incidents.

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## The Navy Has Not Analyzed the Broad Effects of Ship Fires

We found that multiple Navy organizations are analyzing fire-incident data and the effects of fires with relevant organizations and officials. However, no organization is analyzing the broad effects of fires on Navy operations.

Officials from NAVSEA, fleet and type commanders, regional maintenance centers, and the shipyards stated they analyze fire-incident data within their own organizations. They use this data to assess fire safety and the effects of fire incidents within their own areas of responsibility. For example, officials from the regional maintenance centers stated that they use this data to conduct trend analyses on safety deficiencies and inform the type commanders and the Navy Installations Command. In addition, NAVSEA officials stated that they analyze fire-incident data from the shipyards to better understand the root causes and the effects of fire incidents.

We found conflicting views within the Navy about which office is actually responsible for analyzing the broad effects of fire incidents for ships undergoing maintenance. Navy officials from U.S. Pacific Fleet, NAVSEA, and U.S. Fleet Forces Command provided different views on which organization, if any, was responsible for assessing the effects of fires on Navy operations. U.S. Pacific Fleet officials said that they do not measure the effects that fires have on the Navy's strategic resources, but the Chief of Naval Operations might be able to speak to these effects. However, according to officials from the Office of the Chief of Naval Operations, they do not broadly assess the effects of fires. In addition, NAVSEA officials stated that there is no single organization responsible for analyzing the effects of fires. However, U.S. Fleet Forces Command officials told us that NAVSEA Industrial Operations directorate is responsible for analyzing the effects of fires during maintenance periods on Navy operations.

NAVSEA announced leadership and operation changes for its Industrial Operations directorate in February 2022. Specifically, the Industrial Operations directorate's mission was refined to focus on supporting the Navy's four naval shipyards. NAVSEA's Industrial Fire Safety and Assurance Group assumed the responsibility for performing analyses of ship fires using fire-incident data. However, the fire-safety group has not been assigned the responsibility for analyzing the broad effects of fires.



Fires aboard Navy vessels undergoing maintenance have affected the availability of these vessels for deployment. For example, the USS *Bonhomme Richard* fire resulted in more than \$3 billion in damage and a later decision to decommission what would have been one of the Navy's most combat-capable amphibious assault ships. As a result, the Navy has had to make adjustments to which ships are available to support combatant command requirements. For example, officials aboard the USS *Makin Island* with whom we met stated that they had to shorten their maintenance period.<sup>37</sup> According to officials from the Office of the Chief of Naval Operations, they have had to work with fleet commanders to help identify alternatives available to address these requirements; however, they do not broadly assess the effects of fires.

The Standards for Internal Control in the Federal Government states that agencies should assign responsibility and delegate authority to achieve their objectives.<sup>38</sup> The standards further state that agencies should identify, analyze, and respond to risks related to achieving their objectives. However, the Navy has not assigned responsibility to an organization to use existing fire-incident data to analyze and respond to the Navy-wide effects of fire incidents for ships undergoing maintenance to understand the Navy-wide effects that fires have on operations or the nation's strategic resources.

By assigning responsibility to an organization to use existing information to analyze and respond to Navy-wide effects of fire incidents, senior leaders and policymakers can use the information as they prioritize resources for fire prevention and mitigation relative to other competing interests. Further, the Navy would have the necessary information to better understand the magnitude of risks associated with ship-fire incidents and their effects on Navy operations or the nation's strategic resources.

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<sup>37</sup>The USS *Makin Island* is a multipurpose Wasp-class amphibious assault ship.

<sup>38</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

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## Navy Has Taken Steps to Address Personnel Shortfalls to Improve Fire Safety

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### Reduced Personnel during Maintenance Has Contributed to Ship Fire Risks

We found that ships with reduced personnel levels during the maintenance period may contribute to the risk of fire incidents because fewer personnel are available to detect and respond to fires should they occur. For example, in our review of Navy data on personnel levels for five ships included in the *Major Fires Review* that had a fire from 2017 through 2020, we found that four ships reduced enlisted personnel by 4 to 5 percent during the month the fire occurred. Navy officials told us several reasons why ships reduce personnel levels during maintenance periods. Ship personnel may be away to:

- take leave,
- fulfill training requirements, or
- deploy for other missions.

#### Duty Sections During Maintenance

A continuous presence by a portion of a ship's crew is required to ensure the security of the ship and to operate required equipment when the ship is in port or at sea. To achieve this requirement in port, the crew is divided into duty sections that are normally assigned for 24-hour periods. Commanding officers establish the number of duty sections, which affects how frequently a crew member will be required to be onboard. According to a Navy official, depending on the ship conditions, some duty section personnel are moved off the ship during maintenance. Further, ship personnel assigned to a watch to conduct specific duties on a recurring basis remain onboard.

Source: GAO analysis of Navy information. | GAO-23-105481

Navy guidance states that during the maintenance period, ship personnel are to complete training courses. The Commanding Officer of the ship is responsible for ensuring that a sufficient number of trained personnel are available to respond to in-port emergencies on the ship. The Navy's surface ship firefighting guidance directs each ship to have an in-port emergency team, which has the role of rapid responders in the event of a fire onboard.<sup>39</sup> According to Navy officials, ships are required to maintain an in-port emergency team for each duty section throughout the ship's schedule of maintenance, training, and deployment periods. The surface ship guidance also states that a ship's repair party manual must include other resources such as additional ship personnel to relieve in-port emergency teams when fighting a large fire.

We visited five ships that were in maintenance periods. Four of the five ships had personnel levels below what would typically occur when not in

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<sup>39</sup>Navy Tactics, Techniques, and Procedures (NTTP) 3-20.31, Coast Guard Tactics, Techniques, and Procedures (CGTTP) 3-20.31, *Surface Ship Survivability* (June 2012), and Naval Sea Systems Command, Naval Ships' Technical Manual, Chapter 555, Volume 1, *Surface Ship Firefighting* (Aug. 15, 2017).

maintenance. Officials from four ships reported a reduction in the numbers of personnel onboard that ranged from less than 1 percent to about 24 percent during the respective maintenance periods. In addition, during our tour of the USS *San Diego*, ship officials stated that their ship's requirement was about 440 personnel. However, the ship had 310 personnel onboard at the time—about a 30-percent reduction of personnel from the requirement.<sup>40</sup> According to ship officials, the ship's daily crew during a maintenance period is usually reduced by about 26 to 32 percent due to sailors being away for training or leave.

During our tour of the USS *Makin Island*, ship officials stated that the ship was experiencing shortfalls of personnel and they needed additional personnel during the maintenance period. They stated that when a ship is in a long maintenance period, the Navy does not prioritize personnel to provide appropriate numbers of personnel to respond to a fire. The officials said that the Navy prioritizes assigning personnel for those ships performing operations over those undergoing maintenance. According to Navy officials and the *Major Fires Review*, ships undergoing maintenance also have a lower priority for personnel than ships preparing for deployment. The Navy assumes inherent risk during maintenance, according to these officials.

The command investigation of the 2018 fire aboard the USS *Oscar Austin* found that numerous fire-safety positions were not filled for six duty sections because of leave, temporary duty assignments, and other temporary reductions in personnel, according to the Carrier Strike Group Ten commander's endorsement of the command investigation.<sup>41</sup> A duty section is responsible for ensuring safety and security while providing proper performance of required ship functions.

In May 2021, we reported that the Navy routinely assigned fewer crewmembers to its surface ships than its workload studies have determined are needed to operate them safely.<sup>42</sup> The Navy's tracking and

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<sup>40</sup>The USS *San Diego* is a San Antonio-class amphibious transport dock ship.

<sup>41</sup>According to the commander of Carrier Strike Group Ten, the ship experienced shortages in positions such as engineering supervisors, damage control chief petty officer, and in-port emergency team members that were unfilled. Department of the Navy, Carrier Strike Group Ten Endorsement, *Command Investigation Into the Circumstances Regarding the Fire Onboard USS Oscar Austin (DDG 79) on 10 Nov 18* (Jan. 4, 2019).

<sup>42</sup>GAO, *Navy Readiness: Additional Efforts Are Needed to Manage Fatigue, Reduce Crewing Shortfalls, and Implement Training*, [GAO-21-366](#) (Washington, D.C.: May 27, 2021).

reporting process did not accurately measure the full extent of shortfalls, which almost doubled on average from 8 percent in October 2016 to 15 percent in September 2020. We also reported that the Navy used funded positions, rather than requirements to project its future personnel needs. However, this practice did not accurately communicate to internal decisionmakers the number of personnel the Navy will need as the fleet grows, which may prevent effective mitigation of current personnel shortfalls. The Department of Defense (DOD) concurred with our recommendations to the Navy to revise guidance to institutionalize the practice of using personnel requirements to track filled positions, and to use the personnel requirements to project future personnel needs, among other recommendations. As of 2022, DOD had taken actions to implement both recommendations. Therefore, we have closed both recommendations as implemented.

To improve readiness to respond to ship fires, Navy officials stated that they have adjusted the number of duty sections on ships to ensure there are sufficient numbers of personnel on duty to respond to emergencies. According to a Navy official, by decreasing the number of duty sections, ship commanders are able to assign more sailors to a given duty section despite there being no change in the overall number of sailors assigned to a ship. However, fewer duty sections also results in an increase in frequency of these duty assignments for an individual sailor, which limits the time available for other activities. The commander of the Naval Surface Force, U.S. Pacific Fleet, and the commander of the Naval Surface Force Atlantic issued guidance in December 2021 that directed ships to field no more than six in-port duty sections.<sup>43</sup>

According to USS *San Diego* ship officials, they reduced the number of duty sections from six to four in February 2022, which has improved the ship's readiness and responsiveness to a fire emergency, but the change has negatively affected morale. Fewer duty sections on a ship helps to ensure sufficient number of personnel are on duty and available to respond to an emergency, but requires ship personnel to be on 24-hour duty rotations more frequently than they would be with more duty sections. Ship officials explained that they communicate with the Naval Surface Force Pacific on a weekly basis because of these personnel challenges. Also, officials from the USS *Mitscher* explained that when the

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<sup>43</sup>Commander, Naval Surface Forces, *Personal for Commanders and Commanding Officers from VADM Kitchener–Duty Section* (Dec. 17, 2021).

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ship experiences reduced numbers of personnel the ship's leadership will reduce the number of duty sections.<sup>44</sup>

The Navy has guidance to address challenges with personnel levels on submarines and aircraft carriers during maintenance. For example, the Navy's submarine personnel guidance states that during major maintenance periods for the attack submarines, the Navy will increase personnel by one additional officer and 24 enlisted personnel.<sup>45</sup> The Navy authorizes the increases for 6 months before the maintenance period begins and continues them until the end of the period. According to Navy officials, this increase in personnel supports the ship crew workload and allows for training including required qualification training and temporary additional duty assignments, which enhances firefighting readiness in a shipyard environment. Further, according to submarine officials, maintenance periods are identified in advance and the additional personnel are funded for these maintenance timeframes as part of DOD's regular budget process.

In addition, the Navy issued and updated personnel guidance for aircraft carriers during maintenance periods. In August 2020 and again in June 2022, the Commander, Naval Air Forces, directed aircraft carrier commanders to increase the responsibilities and numbers of personnel available to respond to emergencies and those assigned to the in-port emergency teams.<sup>46</sup> According to a Navy official, Navy leadership decided to make these changes during maintenance periods after they discovered deficiencies in fire safety. For example, the commander's June 2022 guidance stated that the results from recent drills based on the 8010 Manual had highlighted gaps in the ability to integrate in-port emergency team and nuclear reactor department personnel, as well as the need for additional hose teams required to suppress a major fire.

Also, shortfalls of supervisory personnel with fire safety-related qualifications affect ship-fire risk during maintenance. After the 2018 fire on the USS *Oscar Austin*, the commander of Carrier Strike Group Ten

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<sup>44</sup>The USS *Mitscher* is an Arleigh Burke-class destroyer ship.

<sup>45</sup>Commander, Submarine Force Atlantic, and Commander, Submarine Force, U.S. Pacific Fleet Instruction 1306.1C, *Submarine Personnel Manual (SUBPERSMAN)* (Sept. 17, 2018).

<sup>46</sup>Commander, Naval Air Forces, *Advance Change Notice One for Standard Repair Party Manual for Naval Air Force* (Aug. 26, 2020); and Commander, Naval Air Forces, *Advance Change Notice Two for Standard Repair Party Manual for Naval Air Force* (June 7, 2022).

stated that the absence of a damage control chief petty officer directly affected the damage-control culture onboard. In addition, in the 2012 USS *Miami* fire panel recommendations report, Navy officials stated that the reduced supervisory presence aboard ships during maintenance periods increases the risk to fire safety. According to the report, the Navy unintentionally reduced fire safety in a high-risk industrial environment where there was a reduction in supervision. These actions were combined with other high-risk activities such as the quantity and intensity of hot work and inoperable or degraded communications systems on ships. The report states that these factors are counter to the Navy's firefighting doctrine and safety-based design assumptions, which rely on a fully staffed and alert crew to quickly identify and aggressively attack a fire.

According to USS *San Diego* ship officials, when a ship experiences turnover of crew members, the ship's leadership has to ensure that incoming crew members are qualified to carry out their duties, which means that there will always be a deficit in qualified personnel. The ship will sometimes get the number of crew members it needs but not necessarily the crew members with the types of qualifications the ship needs. Navy officials stated that although all sailors receive basic firefighting training, not all sailors are qualified as damage control personnel. Damage control personnel include the engineer officer, damage control assistant, and fire marshal with responsibilities such as maintaining a ship's propulsion plant and electric power generators, repairing a ship's hull, and preventing and fighting fires, among other duties. Officials stated that a ship under these conditions will need a large response to quickly fight a fire.

The Navy's 2021 *Major Fires Review* stated that a majority of fire events had occurred during maintenance periods and with reduced personnel levels. Reduced crews meant there were smaller crews available to detect a fire and fewer crewmembers to respond to fires, according to the Navy's review. The Navy found that 11 of the 15 fire events included in the review occurred outside of the normal workday or workweek when there were additional reductions in the number of ship personnel on duty. The Navy found several effects from reduced personnel that contributed to increased fire-related risks: a knowledge gap about leadership and supporting roles among the multiple organizations when responding to fires, delays in fire detection and response, and an increase in the severity of nearly all fires that occurred outside of normal work hours.

Further, the review found that there are not just fewer staff aboard ships during maintenance, but fewer staff with current training certifications and experience in fire safety. The reduction of crewmembers with current training increases the ship's vulnerabilities to a fire. For example, prior to the USS *Bonhomme Richard* fire, the ship's executive officer and damage control assistant rotated during the maintenance period and did not receive the appropriate fire-safety training on the 8010 Manual upon their arrival on the ship. The review stated that the transition of personnel contributed to a poor fire-safety posture and higher risk because in this instance the incoming personnel were not knowledgeable about their assigned duties and responsibilities.

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### The Navy Has Taken Steps to Address Risks of Reduced Ship Personnel during Maintenance

The Navy has taken steps collectively to address risks to fire safety from reduced ship personnel levels and shortfalls of trained fire-safety personnel to respond to fires during maintenance. The Navy has issued new guidance, developed new data and metrics, and conducted safety assessments of ships.

- **Guidance.** Navy leadership issued guidance in December 2021 that addressed personnel shortfalls on ships during maintenance. Specifically, the Commanders of the Naval Surface Force, U.S. Pacific Fleet, and Naval Surface Force Atlantic issued a directive that addressed fire prevention and damage control readiness and to ensure sufficiently qualified personnel are available to respond to fires during maintenance. The commanders conducted their own risk assessment based on no-notice ship assessments and engagement with multiple stakeholders.<sup>47</sup> Based on their findings, the surface commanders directed ship commanding officers to conduct self-assessments of each duty section's ability to prevent a minor fire from progressing to a major fire. Additionally, the surface commanders directed that the commanding officers ensure that each duty section has, among other things, sufficient and qualified in-port emergency

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<sup>47</sup>In May 2021, the Commanders of the Naval Surface Force, U.S. Pacific Fleet and Naval Surface Force Atlantic established the Fire Safety Assessment Program to improve the surface fleet's understanding of the risks associated with fire aboard surface ships in maintenance and drive compliance with existing guidance, among other things. Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 4810.1, *Fire Safety Assessment Program* (May 3, 2021).

team personnel and backup personnel to support the in-port emergency team with fire-safety procedures.

In June 2022, the surface commanders issued an updated directive based on feedback and the commanders' observations that, among other things, directed:

- additional support and flexibility to enhance in-port emergency teams' and duty sections' fire-response capabilities,
- all duty section personnel be qualified in basic firefighting and trained to support the ship's in-port emergency team, and
- commanding officers to report to their immediate superior in command if they are unable to comply with the directive.<sup>48</sup>

In addition, the *Major Fires Review* stated that the Commander, Naval Surface Forces, was considering implementing a minimum threshold for numbers of personnel on a ship during the maintenance phase. The review recommended that the Navy establish a minimum threshold for shipboard personnel for the maintenance period. In September 2022, the commander established minimum thresholds for personnel during the maintenance phase of no fewer than 85 percent of all positions filled.<sup>49</sup> Also, the review found that assuming significant risk in personnel levels on ships during the maintenance period unnecessarily adds to the accumulation of fire-safety risk.

- **Data and metrics.** The Naval Surface Forces commander has been applying metrics to evaluate personnel shortfalls to address recommendations in the *Major Fires Review*. The Commander, Naval Surface Forces, developed a new personnel metric as a way to demonstrate the effect that personnel gaps, based on experience, have on a ship, according to the review and Navy officials. According to Navy officials, the commander has begun applying concepts from this metric to evaluate personnel gaps during maintenance periods for safety and other areas. Once the application of these concepts is fully realized, the Naval Surface Forces will be able to, among other things, link experience and qualifications to other performance data to make more informed personnel decisions, according to Navy officials. For

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<sup>48</sup>Commander, Naval Surface Forces, *Personal for Commanders and Commanding Officers from VADM Kitchener and RADM McLane—Duty Section* (June 13, 2022).

<sup>49</sup>In addition to the minimum personnel threshold of 85 percent for all positions, the Commander, Naval Surface Forces, set a minimum threshold of 80 percent for filling positions with personnel with the specific qualifications.



example, the review stated that site surveys showed some ships' officers did not fully assess the need to provide contractor oversight on multiple shifts and the need to provide senior supervision at all hours when determining the number of duty sections for the ship's maintenance period.

- **Assessment.** Navy officials have been conducting safety assessments and reviewing data to address personnel shortfalls and the effects. According to a Navy official, the Naval Safety Command has begun implementing a three-tier assessment process that will include a review of how the Navy manages personnel to provide sufficient forces for safety, including fire safety during maintenance periods. A Navy official stated that this process would include assessments of command-level risk management practices, inspections for standardization and safety compliance, and unannounced visits to the fleet units to evaluate daily safety standards and behavior. According to a Navy official, the command designed this process to assess the health of the Navy's safety management system and to validate that the Navy will communicate risk among commanders and units and not push risk to the unit level unnecessarily.

According to Navy officials, the Learning to Action Board reviewed crewing data as part of the board's process to prioritize and address recommendations from the *Major Fires Review* and from the command investigation of the USS *Bonhomme Richard* fire. The board has been coordinating with U.S. Fleet Forces and U.S. Pacific Fleet to review crewing data and shortfalls.

According to Navy officials, these efforts are in different stages of implementation and will take time to implement fully. For example, in December 2021 and June 2022, the commanders of the surface forces issued guidance to address duty section personnel. In addition, the Naval Safety Command began implementing its safety assessment process in June 2022.

## Navy Has Not Assessed the Effectiveness of Its Fire-Safety Training Programs

### The Navy Provides Training in Fire Safety and Response through Multiple Approaches

The Navy provides training for ship personnel through various entities and means to respond to fires that may occur on ships during maintenance and to ensure compliance with fire-safety policies. The entities primarily involved with training are described below. For more details about the different training efforts, see appendix IV. Figure 6 summarizes examples of various types of individual training and exercises offered to and assessed by Navy personnel.

**Figure 6: Examples of Various Types of Fire-Safety Training and Exercises Provided by the Navy**

Source	Naval Education and Training Command	Afloat Training Group	Ship leadership	Regional maintenance centers	Fire drills
<b>Training</b>	Provides general and advanced firefighting training. However, training is not specific to maintenance environment.	Provides hands-on damage control training in a maintenance environment, with a focus on the initial response.	Provides continuous training during maintenance activities related to specific aspects of fire safety, such as communications and temporary equipment.	Provide training to ship's fire safety watches, and to ship's crew on fire safety requirements, fire drills and live fire with federal firefighters.	Demonstrates proficiency and coordination of the ship's force, installation firefighters, and mutual aid in responding to a shipboard fire.
<b>Assessment</b>	Provides feedback to students, and obtains feedback from students on course quality and trainers.	Provides feedback on ship's performance through critiques, surveys, and grade sheets.	Conducts debriefings, internal inspections, and exams.	Track fire incidents and evaluates fire drills.	Type commands, Regional Maintenance Centers, federal firefighters, and Naval Sea Systems Command evaluate results of fire drills.
<b>Participants</b>	All sailors and sailors pursuing advanced training	Ship's crew, damage control personnel	Ship's crew, damage control personnel	Ship's crew, fire safety watches, ship leadership	Ship's crew, federal firefighters, regional maintenance centers, type commands

Source: GAO analysis of Navy information. | GAO-23-105481

**Data table for Figure 6: Examples of Various Types of Fire-Safety Training and Exercises Provided by the Navy**

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Assessment	Provides feedback to students, and obtains feedback from students on course quality and trainers.	Provides feedback on ship's performance through critiques, surveys, and grade sheets.	Conducts debriefings, internal inspections, and exams.	Track fire incidents and evaluates fire drills.	Type commands, Regional Maintenance Centers, federal firefighters, and Naval Sea Systems Command evaluate results of fire drills.
Participants	All sailors and sailors pursuing advanced training	Ship's crew, damage control personnel	Ship's crew, damage control personnel	Ship's crew, fire safety watches, ship leadership	Ship's crew, federal firefighters, regional maintenance centers, type commands

Source: GAO analysis of Navy information. | GAO-23-105481

**Naval Education and Training Command.** The command seeks to provide training to sailors in a variety of areas including firefighting to maximize readiness and ensure mission success. This command provides different levels of firefighting on ships from level 0, which is familiarity with damage control and firefighting, to level IV management training for advanced survivability and damage control including firefighting, according to Chief of Naval Operations guidance.<sup>50</sup>

The training command does not have firefighting courses on how to fight a fire during a maintenance period; however, the command has incorporated elements of the 8010 Manual into its courses.<sup>51</sup> For example, according to a Navy official, the level II and higher-level courses—such as the repair party leader and senior damage control assistance courses—address topics such as working with the federal fire departments, pier firefighting, and integrating assistance with different

<sup>50</sup>Office of the Chief of Naval Operations Instruction 3541.1G, *Surface Ship and Submarine Survivability Training Requirements* (Mar. 7, 2016). The officials explained that they also follow the Naval Ships' Technical Manual, Chapter 555 and Navy Tactics, Techniques and Procedures (NTTP) 3-20.31.

<sup>51</sup>Naval Sea Systems Command, Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021).

firefighting partners. In addition, the command developed a 3-day fire marshal training course over the summer of 2021 that includes training on the 8010 Manual because the fire marshal implements the manual's requirements, such as training ship personnel and preventing and responding to fires. According to officials, the command provided the first course in August 2021.

The command investigation of the USS *Bonhomme Richard* fire in September 2021 recommended the development of training for fighting a fire during a maintenance period. Figure 7 shows the different exercises that students participate in during the advanced firefighting training courses at the Surface Warfare Officers School Command within the Naval Education and Training Command in San Diego, California.

**Figure 7: Images of Firefighting Training at the Navy's Surface Warfare Officers School Command**



Source: GAO. | GAO-23-105481

Note: The first photo shows students participating in an advanced firefighting training course. The second photo shows the fire that the students were responding to during the training.

**Afloat Training Group.** Navy guidance states that the Afloat Training Group is responsible for the type commands' training and assessment, and shares responsibility with other Navy organizations to provide fire-

safety training to crew members onboard surface ships during maintenance periods.<sup>52</sup> In addition, Navy officials stated that the Afloat Training Group coordinates with regional maintenance center officials to deliver training to damage control personnel and to all ship personnel before and during a maintenance period. Afloat Training Group officials stated that they primarily conduct hands-on training for ship personnel to respond to a shipboard fire while in a maintenance period. The training consists of how to report the fire, how to activate a Self-Contained Breathing Apparatus, and how to charge and use a fire hose, among other steps.

The Afloat Training Group developed its certification course on Damage Control – Industrial at the direction of the commanders of Naval Surface Force Pacific and Naval Surface Force Atlantic after major fires occurred onboard ships in the maintenance period, according to Navy officials. The group developed the course to address inadequate ship-wide training and integrated training with outside agencies. This course provides training for damage control personnel and all ship personnel on how to prevent and combat fire incidents, and to respond to casualties effectively should they occur. This course, developed in the aftermath of the USS *Bonhomme Richard* fire, is based on the Navy’s surface force guidance and the 8010 Manual, as well as lessons from the *Major Fires Review*.<sup>53</sup> Upon completion of a 5-day certification training, trained personnel will assess the ship’s proficiency in damage control and make a recommendation to the type commander on the ship’s certification. The group began providing the training in April 2021 to all personnel on surface fleet ships prior to a ship entering the maintenance period.

**Ship Leadership.** Officials from each of the five ships we visited discussed the types of fire safety and response training provided to ships’ crews during the maintenance periods. For example, officials from the USS *Makin Island* told us during our ship tour that ship leadership trains the ship’s crew to manage the changing conditions that occur daily on the

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<sup>52</sup>Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3502.7B, *Surface Force Training and Readiness Manual* (Apr. 19, 2021). According to the Navy, the Afloat Training Group provides afloat training to Navy and Coast Guard ship personnel to ensure a combat-ready force is capable of performing a broad range of maritime missions. The group emphasizes training ships’ training teams, among others, to sustain and improve combat readiness throughout a ship’s operational plan.

<sup>53</sup>Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3502.7B, *Surface Force Training and Readiness Manual* (Apr. 19, 2021).

ship due to the maintenance environment. According to these officials, ship personnel train for fire safety every day, and sometimes up to four times a day. Also, they explained that the ship has trained to a scenario like a USS *Bonhomme Richard* fire, which occurred in the lower vehicle storage compartment of the ship. According to Navy guidance, when a commissioned ship is pier side and undergoing maintenance, the commanding officer is in command of the ship's damage control and firefighting efforts.

On the USS *San Diego*, officials stated that fire-safety training is a constant effort. According to the ship's monthly training plan, ship personnel receive training on how to operate hoses and pipes, communications, and fire-safety walk-throughs of the ship. Ship officials stated that ship personnel conduct drills regularly and schedule them one month in advance. They explained that ship leadership conducts training, then ship personnel participate in a drill to test their knowledge. According to these officials, training takes place every day except for Sundays, when personnel take exams. Also, they stated that ship leadership conducts divisional inspections every other week, which elevates the crew's level of knowledge about what areas need improvement.

**Regional Maintenance Centers.** The regional maintenance centers provide training to ship personnel on fire safety and response for the maintenance period. For example, the centers provide training to the ship's fire safety watch on how to oversee hot work, and to all ship personnel in preparation for fire drills, among other efforts. The 8010 Manual directs the regional maintenance centers, among other Navy organizations, to ensure implementation of the manual's policies. According to Navy officials, the regional maintenance centers do so by providing training to ship personnel in a classroom setting and through drills, with some centers providing training indirectly by coordinating with the Afloat Training Group. For example, the regional maintenance centers train the ships' fire safety watches on their responsibilities such as in-port firefighting procedures, hot work oversight procedures, and operating temporary systems and services before the maintenance period begins.

In addition, according to Navy officials, the regional maintenance centers provide ships with training on other aspects of the 8010 Manual and fire safety and response, such as incident response management and shipyard fire-response plans. For example, some regional maintenance centers coordinate with federal fire departments to provide ship personnel with live-fire training.

During our visit to the Mid-Atlantic Regional Maintenance Center, we attended an environmental safety briefing that, according to a center official, is provided to all ship personnel before the maintenance period begins. The briefing incorporates lessons learned from prior ship fires and other safety incidents. Navy officials stated that regional maintenance center officials share fire safety information and provide training to ship personnel as part of the Fire Fighting Prevention Conference held before the maintenance period begins. For example, the officials provide training to ship personnel on how to report a fire or other emergency, and on assembling ship personnel and evacuation processes. The training also provides an overview of temporary fire-safety equipment being installed onboard. In addition, regional maintenance centers take the lead on implementing the 8010 Manual requirements for ship-fire drills.

**Fire Drills.** Ship personnel and Navy organizations responsible for fire safety and response during maintenance periods receive additional training by participating in fire drills mandated by the 8010 Manual. Regional maintenance centers and Navy shipyards, among other Navy organizations, are responsible for planning and conducting fire drills for ship personnel and other fire-safety personnel to demonstrate proficiency in responding to a shipboard fire during a maintenance period. The 8010 Manual outlines two types of fire drills: shipboard fire drills for Navy vessels undergoing maintenance, and major fire drills for each shipyard and regional maintenance center.<sup>54</sup> Additional details about the fire drills can be found in appendix IV.

The Navy takes multiple steps to plan for and execute the guidance for fire drills in the 8010 Manual. For example, some officials stated that they meet with ship officials to begin coordinating and scheduling a shipboard fire drill early in the maintenance period. In addition, some officials stated that they provide training to the ship personnel in advance of the drill, such as fire drill walk-throughs and emergency management procedures. Representatives from multiple organizations, such as the Afloat Training Group, Commander of the Navy Regional Maintenance Centers, type commands, federal fire, and Commander, Navy Installations Command serve as drill execution evaluators. At the conclusion of each fire drill, participants and evaluators discuss what did and did not work well during

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<sup>54</sup>Requirements and guidelines for shipboard fire drills and major fire drills are set forth in chapters 12 and 13 of the 8010 Manual, respectively.

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the drill, issue a report based on the outcomes, and identify lessons learned to incorporate into future fire drills.

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## The Navy Does Not Collectively Assess Fire-Safety Training

The Navy does not have a process for collectively assessing its various training efforts to improve fire safety and response service-wide. Navy training organizations assess their respective training efforts in different ways.

- Evaluation of student progress: According to Navy officials, the Naval Education and Training Command uses a combination of grading sheets and debriefings to evaluate and provide feedback on students' progress and competency. The Afloat Training Group uses grade sheets from its Damage Control-Industrial course. Navy officials explained that the group reviews ships' performance of the 8010 Manual's chapter 12 and chapter 13 fire drills to assess the effectiveness of its training efforts and to make recommendations to type commanders on whether ship personnel should be certified in damage control.
- Evaluation of course quality: In addition, the Naval Education and Training command officials stated that they assess their courses by obtaining feedback from students on course and trainer quality, and by conducting periodic evaluations of trainers. The Afloat Training Group receives feedback from the fleet and crewmembers through critiques and customer feedback surveys, which helps in identifying training gaps.

Navy officials from NAVSEA, Submarine Force Atlantic, the regional maintenance centers, among other officials, cited fire drills and other methods to assess the effectiveness of training. According to some officials, fire drills serve as a primary means by which Navy officials assess fire safety and response training. Officials assess the execution of the drills by conducting debriefings with all participants and evaluators, developing an after-action report, and collecting lessons learned to be shared and incorporated into future fire drills.<sup>55</sup> In addition to fire drills, Navy training officials use other methods to assess fire-safety training such as the type commanders' no-notice assessments of ships during a

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<sup>55</sup>The 8010 Manual outlines the process for conducting fire drills, which includes drill evaluations and the collection of lessons learned.



maintenance period and other audits and assessments related to fire safety, according to these officials.

During our tours of five ships, we learned that ships' leadership assess the effectiveness of their training efforts by conducting internal inspections, exams, drills and debriefings to ship personnel to provide feedback on performance.

The *Major Fires Review* cited training as the second-largest category of corrective actions to address fire-safety concerns from previous major fires. The review identified ineffective day-to-day training and an absence of comprehensive, integrated fire drills with shore-based agencies as underlying fire-safety issues. The review stated that the Navy adequately trains crews to fight fires while ships are underway, but leaves crews unprepared to respond to fires while in port. In addition, Navy personnel expressed concerns about the training they had received. They mentioned concerns about the rigor of the fire drills, and a desire for more hands-on training with damage control equipment and fire-response procedures. In response to the *Major Fires Review*, the Navy has identified corrective actions to improve elements of its training.

Our key practices and Navy guidance state the need for measuring the effectiveness of training. Specifically, our Guide for Assessing Strategic Training and Development Efforts in the Federal Government cites five levels of assessment including measuring the effect of training on organizational performance, as well as several key practices for an agency to assess training effectiveness.<sup>56</sup> The levels measure (1) participant reaction to the training program, (2) changes in employee skills, knowledge, or abilities, (3) changes in on-the-job behaviors, (4) the effect of the training on program or organizational results, and (5) a return on investment that compares training costs to derived benefits. According to the guide, these practices help agencies obtain credible information to understand how training affects organizational performance. The Navy's guidance on training effectiveness cites the same model as our guide regarding steps one through four.<sup>57</sup>

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<sup>56</sup>Naval Education and Training Command Instruction 1540.2B, *NETC Training Effectiveness Program* (May 5, 2021), and GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington, D.C.: March 2004).

<sup>57</sup>Naval Education and Training Command Instruction 1540.2B, *NETC Training Effectiveness Program* (May 5, 2021).

Further, our guide states that assessing the effectiveness of an organization's training efforts include establishing training goals that are consistent with an agency's overall mission, and using related outcome-oriented performance measures to help ensure accountability to assess progress toward achieving results aligned with the agency's mission and goals. To measure the effect of training, the guide states that an agency should have a process to monitor and report on progress based on performance measures and data. In addition, these key practices state that this process can guide the agency in a systematic approach to assessing specific training as well as comprehensively assessing the entire training effort.

The Navy has taken a variety of approaches to assessing the different training efforts it provides. However, the Navy has not ensured the establishment of service-wide goals and performance measures for the Navy's fire-safety training activities, and a process to monitor and report progress toward these goals.

Navy officials provided a variety of responses about whether the Navy has established service-wide goals and performance measures for the Navy's fire-safety training activities or a process to monitor and report progress toward the goals. For example, officials from Navy organizations responsible for implementing corrective actions from ship fires stated that they were not working to establish service-wide training goals at this time or they directed the questions to others who provided inconsistent responses. Also, officials from some of the training organizations stated that they could not speak to the Navy's efforts to establish goals or monitor progress toward the goals, while others stated that the fire drills or Damage Control-Industrial course certification process are service goals. However, the Navy has not established service-wide goals or monitored progress with these existing approaches.

Establishing service-wide goals and performance measures to track progress toward those goals would provide Navy leadership with the information to determine the extent to which all of its training efforts are collectively effective in reducing the incidence and severity of fires. In addition, Navy leadership could use this information to help identify what training efforts are working well toward those goals, which ones should be improved or eliminated, and where gaps lie in order to focus resources on addressing those gaps especially in light of the development of new training courses. Also, by establishing a process to monitor and report progress toward these goals, the Navy could help ensure accountability toward achieving results aligned with the agency's mission.

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## Conclusions

The Navy continues to address challenges to preventing or responding to fires aboard ships during maintenance—fires that caused more than \$4 billion in damage and the complete loss of two ships during a 12-year period. The Navy has also begun taking actions to address lessons learned and the related recommendations made regarding prior fire incidents, but Navy organizations do not have a consistent process to collect, maintain, and share fire incident-related lessons learned to improve fire safety. Instead, these organizations use inconsistent processes. The Navy has not ensured that organizations consistently used the Navy's system of record for lessons learned to collect and share fire-related lessons learned and best practices. Having a consistent collection, analysis, and sharing of lessons learned would help ensure the Navy consistently identifies, maintains, and disseminates lessons learned. In addition, the Navy could reduce the risk of ships repeating costly mistakes and make decisions about when and how to use that knowledge to change behavior.

The Navy has begun taking steps to improve the collection of fire-incident data in the Navy's safety database, but there is no single organization using existing fire-incident data to analyze and respond to the Navy-wide effects of fire incidents for ships undergoing maintenance to understand the Navy-wide effects that fires have on operations. If the Navy had a designated organization to use existing information to analyze and respond to Navy-wide effects of fire incidents, then the Navy could better understand the magnitude of risks associated with ship-fire incidents and their effects on Navy operations or the nation's strategic resources. In addition, senior leaders and policymakers could use the information as they prioritize resources for fire prevention and mitigation relative to other competing interests.

The Navy has developed multiple types of training for personnel to ensure compliance with fire-safety policies and to respond to fires on ships during maintenance, but the Navy has not set service-wide performance measures and goals to determine the effectiveness of all training or developed a process to monitor and report progress toward its goals. With performance measures in place, the Navy could have better visibility on whether these training efforts have reduced the incidence and severity of fires. Finally, goals, monitoring, and reporting progress could help to ensure accountability and progress toward achieving the agency's mission.

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## Recommendations for Executive Action

We are making the following three recommendations to the Secretary of the Navy:

The Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure that the Navy issues guidance to require a process that will allow consistent collection, analysis, and sharing of fire safety-related lessons learned. (Recommendation 1)

The Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure that a single organization is responsible for using existing fire-incident data to analyze the broad effects that fire incidents for ships undergoing maintenance have on Navy operations and inform the Navy's response to risks. (Recommendation 2)

The Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure establishment of (1) service-wide goals and performance measures for the Navy's fire-safety training activities and, (2) a process to monitor and report progress toward these goals. (Recommendation 3)

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## Agency Comments

We provided a draft of this report to DOD for review and comment. In written comments provided by the Navy (reproduced in appendix V), DOD concurred with—and agreed to implement—our recommendations. The Navy also provided technical comments, which we incorporated as appropriate.

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

If you or your staff have questions about this report, please contact me at [MaurerD@gao.gov](mailto:MaurerD@gao.gov) or (202) 512-9627. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix VI.

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Letter

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A handwritten signature in black ink that reads "Diana Maurer". The signature is written in a cursive style with a large, prominent 'D' and 'M'.

Diana Maurer  
Director, Defense Capabilities and Management

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*List of Requesters*

The Honorable John Garamendi  
Ranking Member  
Subcommittee on Readiness  
Committee on Armed Services  
House of Representatives

The Honorable Joe Courtney  
Ranking Member  
Subcommittee on Seapower and Projection Forces  
Committee on Armed Services  
House of Representatives

The Honorable Glenn Grothman  
Chairman  
Subcommittee on National Security, the Border, and Foreign Affairs  
Committee on Oversight and Accountability  
House of Representatives

The Honorable Stephen F. Lynch  
House of Representatives

## Appendix I: Objectives, Scope, and Methodology

This report examines (1) the extent to which the Navy has addressed lessons learned from fire incidents on ships undergoing maintenance and developed a consistent process to improve the collection, analysis, and sharing of lessons learned;<sup>1</sup> (2) the extent to which the Navy has collected and analyzed data about the effects of fire incidents; (3) what steps the Navy has taken to manage personnel levels on ships to respond to the risk of fire incidents during maintenance; and (4) the extent to which the Navy has provided and assessed training to personnel to implement its fire-safety policies when aboard ships undergoing maintenance.

For objective one, we reviewed prior Navy investigation reports on ships that experienced fire incidents from 2008 through 2020 and were included in the Navy's 2021 *Major Fires Review* to determine what recommendations and lessons learned the Navy has previously identified.<sup>2</sup> We also reviewed Navy documents and interviewed Navy personnel regarding how they gather, develop, implement, and share lessons learned following fire events, fire-safety training, and fire drills. We compared the Navy's processes with applicable Navy guidance and best practices that we had previously identified for lessons learned processes.<sup>3</sup> We reviewed the Navy's processes for identifying and sharing fire-related lessons learned from fire incidents that have occurred since 2008.

Additionally, we interviewed Navy officials regarding the Navy's lessons-learned process (i.e., the Navy's process for collecting and sharing lessons learned), as well as actions the Navy has taken to implement

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<sup>1</sup>For the purposes of this report, we use the term "lessons learned" to include best practices, corrective actions, action items, and recommendations.

<sup>2</sup>Navy, Commander, U.S. Fleet Forces Command and Commander, U.S. Pacific Fleet, *Major Fires Review* (July 15, 2021).

<sup>3</sup>Office of the Chief of Naval Operations Instruction 3500.37D, *Navy Lessons Learned Program* (June 20, 2018), and GAO, *Federal Real Property Security: Interagency Security Committee Should Implement a Lessons-Learned Process*, [GAO-12-901](#) (Washington, D.C.: Sept. 10, 2012).

lessons learned from fire incidents. Moreover, we determined the control environment and information and communication components of the Standards for Internal Control in the Federal Government were significant to this objective, specifically the associated underlying principles that management should implement control activities through policies and use quality information to achieve the entity's objectives.<sup>4</sup>

For objective two, we reviewed Navy documents related to fire incidents that occurred during maintenance from 2012 through 2022 in terms of cost and scheduling, information collection and assessment of fire-incident data, and the effects of maintenance fires on personnel and ships. We compared the Navy's processes for information collection and assessment against the Department of Defense's (DOD) guidance.<sup>5</sup> We interviewed and obtained written responses, as needed, from officials from the Naval Safety Command, Naval Sea Systems Command (NAVSEA), and the fleet commands to discuss the collection, maintenance, and validation of fire-incident data. The Naval Safety Command oversees the Risk Management Information system and the collection of safety incident data—including fire-incident data—for the Navy.

We also reviewed documentation that shows how fire-incident data is submitted in the Risk Management Information system and reviews related to historical fire incidents, such as the Naval Safety Command's fiscal year 2019 abstract on the underreporting of fire incidents. We determined that there were limitations with the historical fire-incident data collected from the Naval Safety Command. Specifically, we determined that the data on fire incidents with less than \$2.5 million in property damage was incomplete. In addition, we interviewed Navy officials to determine the extent to which the Navy has collected data on the effects of maintenance fires and how maintenance fires have affected the maintenance schedules and the availability of ships.

For objective three, we reviewed the Navy's July 2021 *Major Fires Review* and fire investigation reports from 2012 through 2020 to identify challenges and risks associated with reduced personnel levels on ships

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<sup>4</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

<sup>5</sup>Office of the Chief of Naval Operations Manual 5102.1, Marine Corps Order 5100.29C, vol. 9, *Navy and Marine Corps Safety Investigation and Reporting Manual* (Sept. 27, 2021) and Department of Defense Instruction 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping* (June 6, 2011) (incorporating change 1, Aug. 31, 2018).



during maintenance. We reviewed the Navy's guidance documents on fire-safety policy and procedures for ships undergoing maintenance to identify any requirements for specific fire-safety personnel and for overall ship personnel levels. Also, we interviewed officials from multiple Navy organizations to identify the Navy's personnel priorities and how the Navy allocates personnel resources throughout ships' operational plans. Further, we interviewed Navy officials from multiple organizations and specifically ship officials during the team's site visits to identify any challenges to fire safety and response with reduced personnel and steps they are taking to address those challenges. We obtained supporting documentation that outlined the steps the Navy has planned to take or has taken.

For objective four, we reviewed the Navy's 2021 *Major Fires Review* and fire investigation reports from 2012 through 2020 to identify challenges with training ship personnel for fire safety and response during maintenance. In addition, we reviewed the Navy's guidance documents on fire-safety policy and procedures for ships undergoing maintenance to identify any personnel training requirements. Further, we reviewed the Navy's training guidance for firefighting, fire safety, and response to include any guidance that pertained to training specifically for fire incidents that occur on ships during maintenance. We reviewed the Navy's multiple training efforts and assessment practices, the Navy's guidance for assessing training, and our *Guide for Assessing Strategic Training and Development Efforts in the Federal Government*.<sup>6</sup>

Additionally, for objectives three and four, we conducted site visits on five ships undergoing maintenance. We selected ships that were located on a naval base, a naval shipyard, and a private shipyard to learn about and observe the implementation of the Navy's fire-safety guidance in these different locations. In addition, we selected ships at locations where we had the opportunity to observe live firefighting training and fire-drill planning. Further, we selected ships based on those that were undergoing maintenance during our site visits in San Diego, California, and Norfolk, Virginia.

During our site visits, we interviewed ships' leadership and fire-safety personnel, and contractors performing maintenance work on the specific

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<sup>6</sup>Naval Education and Training Command Instruction 1540.2B, *NETC Training Effectiveness Program* (May 5, 2021), and GAO, *Human Capital: A Guide for Assessing Strategic Training and Development Efforts in the Federal Government*, [GAO-04-546G](#) (Washington, D.C.: March 2004).

ships. These interviews included officials from the type commanders and from Naval Sea Systems Command including the regional maintenance centers. We interviewed these Navy officials regarding the sufficiency of personnel to execute fire safety during maintenance, fire-safety training, and any planned improvements in fire-safety policies, procedures, and training.

We interviewed or otherwise obtained information from the following organizations and offices:

- Deputy Assistant Secretary of the Navy for Ship Programs.
- Naval Safety Command.
- Naval Education and Training Command's Surface Warfare Schools Command and the Submarine Learning Center.
- Naval Facilities Engineering Systems Command.
- Commander, Navy Installations Command, including Fire and Emergency Services, Port Operations.
- Naval Sea Systems Command's offices and organizations:
  - Industrial Fire Safety and Assurance Group (SEA 00FS).
    - Industrial Operations (SEA 04).
      - Norfolk Naval Shipyard; Portsmouth Naval Shipyard; Puget Sound Naval Shipyard and Intermediate Maintenance Facility; and Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility.
  - Supervisor of Shipbuilding, Conversion, and Repair.
  - Naval Systems Engineering & Logistics (SEA 05).
    - Commander, Regional Maintenance Centers (SEA 21).
      - Mid-Atlantic Regional Maintenance Center; Southeast Regional Maintenance Center; Southwest Regional Maintenance Center; Forward Deployed Regional Maintenance Center; Northwest Regional Maintenance Center; and Hawaii Regional Maintenance Center.
- Navy Warfare Development Center.
- U.S. Fleet Forces Command, including Commander, Naval Air Force Atlantic; Commander, Naval Surface Force Atlantic; and Commander, Submarine Force Atlantic.

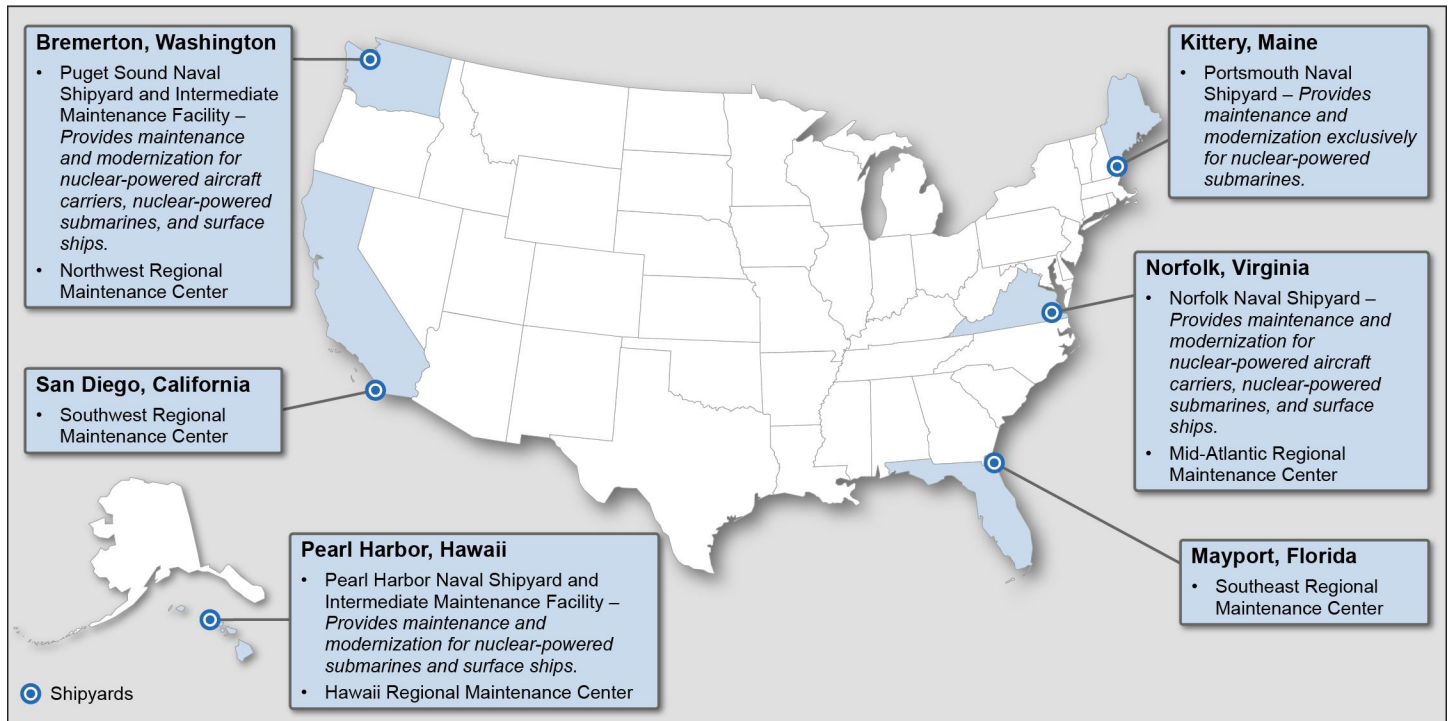
- U.S. Pacific Fleet, including Commander, Naval Surface Force, U.S. Pacific Fleet; Commander, Naval Air Force, U.S. Pacific Fleet; and Commander, Submarine Force, U.S. Pacific Fleet.
- Vice Chief of Naval Operations' Learning to Action Board.

The audit team conducted site visits and toured ships at the following locations:

- Naval Base San Diego, including the Southwest Regional Maintenance Center, the Surface Warfare Officers School Command, and the USS *Makin Island* (LHD 8).
- USS *San Diego* (LPD 22) at BAE Systems San Diego Ship Repair, San Diego, CA.
- Norfolk Naval Shipyard, including the USS *Dwight D. Eisenhower* (CVN 69).
- Naval Station Norfolk, including the Mid-Atlantic Regional Maintenance Center.
- USS *Mitscher* (DDG 57) at BAE Systems Norfolk Ship Repair, Norfolk, VA.
- USS *Iwo Jima* (LHD 7) at General Dynamics NASSCO-Norfolk, Norfolk, VA.

Figure 8 shows where the regional maintenance centers and naval shipyards are located in the U.S.

Figure 8: Locations of the Regional Maintenance Centers and Naval Shipyards in the U.S.



Source: GAO analysis of Navy information. | GAO-23-105481

**Text of Figure 8: Locations of the Regional Maintenance Centers and Naval Shipyards in the U.S.**

- Bremerton, Washington:
  - Puget Sound Naval Shipyard and Intermediate Maintenance Facility – Provides maintenance and modernization for nuclear-powered aircraft carriers, nuclear-powered submarines, and surface ships.
  - Northwest Regional Maintenance Center
- San Diego, California:
  - Southwest Regional Maintenance Center
- Pearl Harbor, Hawaii
  - Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility – Provides maintenance and modernization for nuclear-powered submarines and surface ships.
  - Hawaii Regional Maintenance Center

- Kittery, Maine:
  - Portsmouth Naval Shipyard – Provides maintenance and modernization exclusively for nuclear-powered submarines.
- Norfolk, Virginia:
  - Norfolk Naval Shipyard – Provides maintenance and modernization for nuclear-powered aircraft carriers, nuclear-powered submarines, and surface ships.
  - Mid-Atlantic Regional Maintenance Center
- Mayport, Florida:
  - Southeast Regional Maintenance Center

Source: GAO analysis of Navy information. | GAO-23-105481

We conducted this performance audit from November 2021 to April 2023 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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## Appendix II: Summary of the Navy's July 2021 *Major Fires* Review

Following the USS *Bonhomme Richard* fire, the Naval Safety Command began a comprehensive historical review of major fires onboard U.S. Navy ships.<sup>1</sup> The Naval Safety Command identified multiple recurring trends in causal factors in 15 shipboard fire-related events over a 12-year period. The command concluded that non-compliance with fire prevention, detection, and response policies and procedures was likely prevalent across the fleets. Based on their conclusions, the command sent a Safety Assurance Letter to the Commander, U.S. Fleet Forces Command; Commander, U.S. Pacific Fleet; Commander, Naval Sea Systems Command; and Commander, Naval Installations Command, through the Vice Chief of Naval Operations.

In response to this letter, the Vice Chief of Naval Operations directed the Fleet Commanders to complete the review to understand and address systemic issues underlying the persistence of shipboard fire incidents and to recommend actions that establish the necessary culture and standards required to change Navy fire-safety outcomes in an enduring way. The Vice Chief tasked the Fleet Commanders with examining the 15 major fire events to answer the following questions:

- Why actions put in place following major fire incidents, such as implementation of Navy guidance specific to industrial ship safety for fire prevention and response and related guidance did not sustainably achieve the desired outcome;
- Why appropriate unit-level standards were not consistently sustained relative to material control, cleanliness, and fire-response readiness;
- Why oversight from the ship's chain of command did not reliably identify and correct unit-level performance gaps and noncompliance;

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<sup>1</sup>For the purposes of this report, we refer to the Naval Safety Center as the Naval Safety Command. Navy, Commander, U.S. Fleet Forces Command and Commander, U.S. Pacific Fleet, *Major Fires Review* (July 15, 2021).

- Why reporting mechanisms were not effective in providing a view of the actual risk posture;
- Why lessons learned from other adverse performance events were not accelerated into fire-safety doctrine and practice; and
- Why independent oversight organizations, such as the Naval Safety Command, were not effective in identifying the problems for fleet action.

With the Vice Chief of Naval Operation's specific questions as a guide, a review team set out to identify any systemic issues regarding the standards, culture and environment that are driving a lack of discipline in stowage and cleanliness; noncompliance with applicable governance; or an insufficient level of fire-safety readiness. The review team did not limit the review to the historical incidents but also conducted a series of site visits and unit assessments to evaluate the current state of compliance with fire-safety requirements and overall posture of the fleet.

The Navy identified a number of lessons learned in wide-ranging areas in its *Major Fires Review*, including that there was improper hazardous and combustible material handling and stowage, which had caused or had an increase in severity in 60 percent of the fires reviewed. The review recommended that the type commanders conduct regular, unannounced inspections of ships undergoing maintenance to address improper stowage of combustible and hazardous materials and excessive quantities of these materials being brought aboard. The review also revisited a previous proposal from the 2012 Miami fire panel recommendations to initiate funding and installation of fire-detection systems for new ship construction and in-service ships.

The Navy has begun implementing corrective actions from the *Major Fires Review*. Specifically, the Navy (1) created an oversight body to drive transparency and accountability for implementing and assessing approved recommendations from reviews, investigations, reports, and studies; (2) elevated the Naval Safety Center into a command—the Naval Safety Command—to enable effective safety management across the Navy; and (3) established the Industrial Fire Safety Assurance Group within NAVSEA to be the command's lead for improving fire safety on ships undergoing maintenance and on ships in new construction. Navy officials stated that they expect it will take 2 to 3 years to apply all of the corrective actions that were identified in the *Major Fires Review*.

Additionally, the Navy has other actions it plans to take, including the development of strategies to aid in the identification of potential arsonists based on typical threat recognition factors. The Navy also plans to fund the assessment and implementation of improved ship fire-prevention features and materials, such as increased use of fire insulation. Further, the Navy plans to address pier infrastructure challenges by defining and ensuring compliance with pier fire-safety requirements for ships in maintenance periods.<sup>2</sup>

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<sup>2</sup>For the purposes of this report, we will use the term “maintenance period” to mean maintenance availability. A maintenance availability is any maintenance or modernization period where industrial work (such as maintenance, repair, modernization, inactivation, recycling, disposal, or construction) is being performed. Naval Sea Systems Command Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021).



## Appendix III: Navy Organizations and Commands Responsible for Fire Safety, Prevention, and Response

A number of Navy organizations and commands share responsibilities for providing

- oversight of fire safety,
- fire-response training, and
- fire-response assistance.

Key organizations include the following:

The Navy established the **Learning to Action Board** in November 2021 as an oversight body to drive transparency and accountability for implementing and assessing approved recommendations from reviews, investigations, reports, and studies. The board is co-chaired by the Under Secretary of the Navy and the Vice Chief of Naval Operations. The board's responsibilities include the following:

- ensure implementation of recommendations are fully achieved;
- set objectives and outcomes for recommendation implementation;
- provide or identify resources for recommendation implementation, as appropriate;
- approve action plans and outcome metrics;
- track the completion of approved recommendations, among other tasks; and
- drive Navy-wide organizational learning.

According to Navy officials, the board is a permanent body that has developed a mechanism for ensuring that corrective actions to address lessons learned from the *Major Fires Review* and the command investigation of the USS *Bonhomme Richard* fire are implemented.

In February 2022, the Navy elevated the Naval Safety Center into a command—the **Naval Safety Command**—to enable effective safety management across the Navy.<sup>1</sup> The new command maintains and oversees the Navy’s online reporting system and, according to Navy officials, is responsible for all Navy safety policies and guidance, which are updated on a 5-year schedule. As the National Fire Incident Reporting System program manager, the Naval Safety Command provides fire-incident summary data and analysis to all DOD components.<sup>2</sup> The command, through its Naval Safety and Environmental Training Center, also offers multiple courses related to fire safety and prevention. Examples are Fire Protection and Life Safety, Safety Programs Afloat, and Hazardous Material Control and Management. According to Navy officials, these training courses are generally offered as an elective and are tailored to one’s position.

The Naval Safety Command developed a three-tiered assessment process to evaluate compliance and performance of safety and risk management at all command levels, according to Navy documentation and officials. The process is also specifically designed to ensure communication throughout the chain of command rather than being relegated to the unit level unnecessarily. The three assessment tiers are:

- **Management Command Assessments**—This tier of assessments will look at the top of the naval enterprise to ensure senior leaders are proactively managing risk within their organizations and subordinate commands. In addition, the Naval Safety Command will assess how risk is being communicated and managed up from the unit and communicated down from the top.
- **Inspection/Certification Team Assessments**—This tier of assessments focuses on ensuring compliance to the standards for inspection and certification teams, such as the Afloat Training Group, to validate that all units are certified to the same level of competence.
- **Local Area Assessments**—This tier of assessments involves multi-disciplinary teams (Aviation, Shore, Surface, Ship and Expeditionary)

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<sup>1</sup>For the purposes of this report, the Naval Safety Center will be referred to as the Naval Safety Command.

<sup>2</sup>The National Fire Incident Reporting System is a reporting standard that fire departments use to uniformly report on the full range of their activities, from fire to emergency medical services, as well as severe weather and natural disasters. The reporting system software is available at no cost to all states, including the District of Columbia, tribal and territorial agencies, and fire departments. The National Fire Incident Reporting System is the world’s largest, national, annual database of fire-incident information.

making unannounced visits to different fleet concentration areas to perform no-notice walk-throughs to evaluate day-to-day standards at the unit level. These observations are used to evaluate the local command's oversight and standards.

The **Naval Sea Systems Command (NAVSEA)** serves as a central source for firefighting information pertaining to fire incidents, ship and submarine leadership responsibilities, service member performance, and equipment, among other things. The command provides training support for new or modified equipment, systems and techniques, as well as equipment and analytic support to meet firefighting training requirements. The command also provides technical information, analytic support, and reports on a continuing basis for use in developing training curricula and course materials.

In August 2021, NAVSEA established the **Industrial Fire Safety Assurance Group** to be the command's lead for improving fire safety on ships undergoing maintenance and ships in new construction. This fire-safety group is responsible for developing and coordinating industrial fire-safety assurance guidance across the NAVSEA enterprise. In addition, the fire-safety group serves as the lead for conducting analyses of industrial fire metrics, reviewing and investigating industrial ship fires, and developing mitigating actions to address risks and issues from such incidents. In addition, the group's purpose is to promote a culture of perpetual fire-safety vigilance, and establish clear lines of accountability to the Commander. According to NAVSEA officials, the group is working with the Learning to Action Board to track recommendations from prior fire reviews, including the USS *Bonhomme Richard* command investigation and the *Major Fires Review*, to ensure that they have been adjudicated and closed.

The **Commander, Navy Regional Maintenance Center**, through the regional maintenance centers, provides oversight to private-sector contractors executing maintenance at private shipyards, according to Navy documentation and officials. The oversight includes:

- ensuring that NAVSEA Standard Items, including contractual fire-safety requirements, are being met during the maintenance period,
- overseeing the execution of the maintenance and repair work, and
- ensuring the delivery of the ship with the proper maintenance or repair work completed.

The **Regional Maintenance Centers** provide ship repair, industrial, engineering and technical support services for ships, including procurement, administration, and oversight of contracts for ship maintenance and modernization—including fire safety, prevention, and response, according to Navy documentation and officials.

The **NAVSEA Industrial Operations Directorate** oversees the four public naval shipyards—Portsmouth Naval Shipyard in Kittery, Maine, Norfolk Naval Shipyard in Portsmouth, Virginia, Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Bremerton, Washington, and Pearl Harbor Naval Shipyard and Intermediate Facility in Hawaii.

The **Naval Education and Training Command** issues policy and provides technical guidance and support to assist subordinate commands in conducting safe firefighting training. The command's firefighting training program has a goal to minimize the probability of incidents and related injuries to students and staff during formal training.

According to Navy officials, the **Afloat Training Group** is responsible for providing damage control training to personnel aboard surface ships undergoing maintenance. Specifically, the Afloat Training Group provides training to sailors to ensure that they have the skills necessary to promote fire safety aboard Navy vessels. Afloat Training Group trainers assess all administrative records, train watch standers in the ability to safely respond to multiple casualties in an industrial environment prior to entering the shipyard or industrial environment, and make a final assessment and recommendation for certification to the type commander.

According to Navy documentation and officials, **Fire and Emergency Services** implements all fire and emergency services at Navy installations, including having oversight over the fire departments at the Navy installations and participates with NAVSEA on major fire drills.<sup>3</sup> Fire and Emergency Services supports the firefighting efforts of the primary responder, the ship's force, for ship fires at naval installations and public shipyards. Fire and emergency services also assists the ship's

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<sup>3</sup>Naval Sea Systems Command Technical Publication S0570-AC-CCM-010/8010, *Industrial Ship Safety Manual for Fire Prevention and Response* (Feb. 11, 2021), and Office of the Chief of Naval Operations Instruction 11320.23G, *Navy Fire and Emergency Services Program* (Feb. 4, 2013).

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**Appendix III: Navy Organizations and  
Commands Responsible for Fire Safety,  
Prevention, and Response**

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Commanding Officer, who typically serves as the incident commander,  
with leading firefighting operations.

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## Appendix IV: Navy's Firefighting Training Programs

The following summarizes several of the Navy's firefighting efforts that may apply to fighting a fire during a maintenance period.<sup>1</sup>

Navy Education and Training Command. The training command provides firefighting training based on Navy guidance for survivability requirements. The different training levels include the following types of instruction:

- Level 0: All enlisted recruits assigned to the Navy Recruit Training Command receive level 0 firefighting training, which provides a general familiarization with survivability and damage control and includes prevention and control of fires and damage control drills.
- Level I: Sailors whose first duty assignment will be a ship or submarine are required to receive initial level I basic ships and submarine training at the Naval Service Training Command (NSTC). According to a Navy official, this is a 1-day course of in-class and laboratory instruction in a live-fire bay area to learn how to combat a kitchen fire. Students also learn how to use a fire hose and how to apply water or fire retardant, based on the type of fire, among other things.
- Level II: Ship personnel such as in-port emergency team members, damage control personnel, and all submarine personnel based on the type commanders' direction are required to take the level II advanced course. According to a Navy official, this 4-day course consists of 8 hours of classroom training on more-advanced firefighting techniques and on command and control. In addition, the students receive 3 days of training with live fire events that gradually build up in scope and include most classes of fire.
- Level III: The team-level training is required for those ship personnel such as repair-party leaders and in-port emergency team members

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who need additional survivability and damage control training as members of a team or repair party, and for all submarine personnel. According to a Navy official, this course trains students to manage and run everything to fight a fire, including how to address casualties and a change in ship leadership to test the students' response to adversity.

- Level IV: The management-level training is required for those ship personnel with administrative duties that require additional survivability and damage control training, such as commanding officers, executive officers, surface ship and submarine damage control personnel, and others. According to a Navy official, this training consists of reviewing more fire-safety policies and procedures, learning how to track personnel, and learning about reporting procedures. The training includes procedures on how to conduct survivability drills and training properly, fire and mass casualty control, and battle-related topics, among others.

Navy officials stated that the command is developing a new course that more specifically addresses firefighting for ships in their maintenance periods. They explained that the Naval Education and Training Command's Submarine Learning Center is developing an industrial firefighting course that integrates with the Navy's Fire and Emergency Services and surface ships and includes significant training on the 8010 Manual's procedures. According to the officials, the course is in the early phases of development with the classroom portion completed. Sailors will be expected to take the course every 18 months or prior to a maintenance period.

Afloat Training Group.<sup>2</sup> According to Navy documentation and officials, the Damage Control–Industrial course takes place in four phases: an administrative review about 3 months prior to a ship entering a shipyard; training about 1 month prior to entering shipyard; certification which takes place 2-3 weeks after entering a shipyard; and repetitive exercises every 60 to 180 days following the certification. The training portion consists of a 5-day in-port training event that focuses on practical training to prepare ship and crew to combat casualties in an industrial environment prior to entering a shipyard. According to Navy documentation and officials, once ships are in a shipyard environment, they complete a 5-day certification event that requires ship personnel to demonstrate the required knowledge level and proficiency with damage control responsibilities, such as

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<sup>2</sup>According to Navy officials, the Afloat Training Group delivers training to damage control personnel and all ship personnel before and during a maintenance period.

responding to fires, flooding, structural damage, and hazardous material spills.

Fire Drills. Chapter 12 of the 8010 Manual directs Navy vessels undergoing chief of naval operations maintenance periods to conduct a shipboard fire drill: for submarines, one drill every 90 days and for surface ships one drill every 180 days. Chapter 13 of the 8010 Manual directs an annual major ship fire drill to comprehensively evaluate a Naval shipyard's or regional maintenance center's execution of its Fire Response Plan and emergency response capability. According to the 8010 Manual, the fire drills should have the following attributes:

- Chapter 12 fire drills: According to the manual, this drill includes attributes such as requiring participants to plan for and prepare to execute an extended response; partially obscuring visibility within the ship to simulate realism; executing multiple firefighting techniques; and handling hoses and nozzles, among others. Further, the manual directs that officials design a drill that is as realistic as possible without risking injury or equipment damage, and should challenge the participants' ability to respond to a fire and to unexpected situations that may occur. The participants include ship personnel and the Navy's fire and emergency services.
- Chapter 13 drills: According to the 8010 Manual, this drill has attributes such as activating the location's emergency response team and emergency operations center; exercising the ability to medically triage and treat at least two simulated injured personnel; requiring the replenishment of firefighting equipment; and exercising the ability to de-smoke amphibious ship decks and fires in submarine battery wells. The participants include multiple Navy organizations, the type commanders, and local fire departments, among others.

In addition, according to Navy officials, the Afloat Training Group's training efforts include a collaborative effort with the Commander, Navy Installations Command for the execution of these drills as capstone events.



# Appendix V: Comments from the Department of the Navy



THE ASSISTANT SECRETARY OF THE NAVY  
(RESEARCH, DEVELOPMENT AND ACQUISITION)  
1000 NAVY PENTAGON  
WASHINGTON DC 20350-1000

MAR 31 2023

Ms. Diana Maurer  
Director, Defense Capabilities Management  
U.S. Government Accountability Office  
441 G Street, NW  
Washington DC 20548

Dear Ms. Maurer,

Attached are the Department of Defense (DoD) technical comments and responses to the recommendations in GAO Draft Report GAO-23-105481SU "NAVY SHIP FIRES: Ongoing Efforts to Improve Safety Should Be Enhanced" (GAO Code 105481).

Sincerely,

A handwritten signature in black ink, appearing to read "Fred J. Stefany".

Frederick J. Stefany  
Assistant Secretary of the Navy  
(Research, Development and Acquisition)  
Acting

Attachments:  
As Stated

**GAO DRAFT REPORT DATED FEBRUARY 16, 2023  
GAO-23-105481 (GAO CODE 105481)**

**“NAVY SHIP FIRES: ONGOING EFFORTS TO IMPROVE SAFETY SHOULD BE  
ENHANCED”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION**

**RECOMMENDATION 1:** The GAO recommends that the Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure that the Navy issues guidance to require a process that will allow consistent collection, analysis, and sharing of fire safety-related lessons learned.

**DoD RESPONSE:** Concur. The Secretary of the Navy will collaborate with the Office of the Chief of Naval Operations to ensure that the Navy issues guidance to require a process that will allow consistent collection, analysis, and sharing of fire safety-related lessons learned.

**RECOMMENDATION 2:** The GAO recommends that the Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure that a single organization is responsible for using existing fire-incident data to analyze the broad effects that fire incidents for ships undergoing maintenance have on Navy operations and inform the Navy’s response to risks.

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**RECOMMENDATION 3:** The GAO recommends that the Secretary of the Navy, in collaboration with the Office of the Chief of Naval Operations, should ensure establishment of (1) service-wide goals and performance measures for the Navy’s fire safety training activities and, (2) a process to monitor and report progress toward these goals.

**DoD RESPONSE:** Concur. The Secretary of the Navy will collaborate with the Office of the Chief of Naval Operations to ensure establishment of service-wide goals and performance measures for the Navy’s fire safety training activities and a process to monitor and report progress towards these goals.

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## Text of Appendix V: Comments from the Department of the Navy

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Director, Defense Capabilities Management

U.S. Government Accountability Office 441 G Street, NW

Washington DC 20548

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Sincerely,

Assistant Secretary of the Navy

(Research, Development and Acquisition) Acting

Attachments: As Stated

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GAO DRAFT REPORT DATED FEBRUARY 16, 2023 GAO-23-105481 (GAO CODE 105481) "NAVY SHIP FIRES: ONGOING EFFORTS TO IMPROVE SAFETY SHOULD BE ENHANCED" DEPARTMENT OF DEFENSE COMMENTS TO THE GAO RECOMMENDATION

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## Appendix VI: GAO Contact and Staff Acknowledgments

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### GAO Contact

Diana Maurer at (202) 512-9627 or [MaurerD@gao.gov](mailto:MaurerD@gao.gov).

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### Staff Acknowledgments

In addition to the contact named above, individuals who made key contributions to this report include Brent Helt (Assistant Director), Nicole Harris (Analyst in Charge), Laurier Fish, Alexandra Gonzalez, David L. Jones, Richard Kusman, Jean McSween, Diana Moldafsky, Richard Powelson, Paulina Reaves, Jasmine Sammons, and Roger Stoltz.

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