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March 2024

# MILITARY READINESS

## Comprehensive Approach Needed to Address Service Member Fatigue and Manage Related Efforts

# GAO Highlights

Highlights of [GAO-24-105917](#), a report to the Committee on Armed Services, House of Representatives

## Why GAO Did This Study

Fatigue caused by inadequate sleep can negatively affect a service member's performance and has contributed to accidents resulting in deaths and hundreds of millions of dollars in damage to ships, vehicles, and aircraft. DOD recognizes that impairment from fatigue can be equivalent to the effects of alcohol intoxication and significantly increases the risk of physical injury.

House Report 117-118, which accompanied a bill for the National Defense Authorization Act for Fiscal Year 2022, includes a provision for GAO to review DOD's efforts to limit sleep deprivation and manage fatigue across the military services. Among other things, this report assesses the extent to which (1) service members are getting adequate sleep and (2) DOD has addressed and managed service member fatigue.

GAO analyzed fatigue-related policies and guidance; interviewed cognizant officials; and surveyed service members from selected occupations, including pilots, aviation maintenance personnel, missileers, and motor vehicle operators.

## What GAO Recommends

GAO is making nine recommendations, including that DOD conducts an assessment of its fatigue-related oversight structure, assigns DOD leadership, and creates and maintains a list of all fatigue-related research projects, and that the military services assign fatigue-related leadership. DOD generally concurred with the recommendations.

View [GAO-24-105917](#). For more information, contact Diana Maurer at (202) 512-9627 or [MaurerD@gao.gov](mailto:MaurerD@gao.gov).

March 2024

## MILITARY READINESS

# Comprehensive Approach Needed to Address Service Member Fatigue and Manage Related Efforts

## What GAO Found

Many service members are not getting the Department of Defense (DOD) recommended 7 or more hours of sleep each day. The department's overarching fatigue-related guidance emphasizes service members obtain at least 7 hours of sleep for optimal performance and readiness. For over a decade, DOD surveys have found that the majority of service members report sleeping 6 or fewer hours per night. Respondents to GAO's nongeneralizable survey cited similar issues. For example, many respondents are sleeping too little, and roughly half of respondents have poor sleep quality regardless of quantity. Survey respondents provided examples of how sleep deprivation has affected their work, from nearly colliding with another aircraft to falling asleep on the job.

### Service Members on How Sleep Deprivation Has Affected Their Work

"Slow reaction time. Almost collided with another aircraft due to mental fatigue."

— Remotely piloted aircraft pilot

"Sometimes when I'm driving, I find myself falling asleep and I have to catch myself. I could kill someone on accident because I'm not getting the right sleep."

— Motor vehicle operator

"Slower response and processing times. Leads to greater possibility of mistakes made while sleep deprived."

— Aviation maintainer

Source: GAO survey responses. | GAO-24-105917

DOD and the services have taken steps to address fatigue-related issues, such as developing guidance on fatigue management, but DOD faces oversight and enterprise-wide collaboration challenges in managing fatigue.

- **Oversight structure limitations.** DOD has not identified and delegated sufficient oversight authority at the department level, and the military services have not assigned leadership to oversee service-level efforts. Without an assessment of DOD's oversight structure and assigning DOD and service-level leadership, DOD will be hindered in its efforts to limit and manage fatigue across the department.
- **Fragmented fatigue-related research.** GAO identified nearly 130 fatigue-related research projects the Army, Navy, Marine Corps, and Air Force conducted from 2017 to 2023. Forty-eight of these projects studied the use of wearable devices to track sleep data among other uses, with many of them using the same type of technology or even the same model. Establishing a list of all fatigue-related research will help DOD gain visibility and reduce any fragmentation that may exist, potentially leading to cost savings.

### Wearable Device Use Across Services for Fatigue-Related Research, 2017—2023

	Smart watches	Dedicated sleep/activity/health trackers	Smart rings	Headgear	Heart monitors
Army	●	●	●	●	●
Navy	●	●	●	●	●
Marine Corps	●	●	●	●	●
Air Force	●	●	●	●	●

Source: GAO analysis of Department of Defense information; Macrovector/stock.adobe.com (icons). | GAO-24-105917

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## Abbreviations

CREW	Command Readiness, Endurance, and Watchstanding
DOD	Department of Defense
OHWS	Optimizing the Human Weapon System
OWL	Optimized Watchbill Logistics

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March 26, 2024

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

Fatigue caused by inadequate sleep can negatively affect a service member's military performance and has contributed to accidents resulting in service member deaths and hundreds of millions of dollars in damage to Department of Defense (DOD) ships, vehicles, and aircraft, according to our prior work and the National Commission on Aviation Safety.<sup>1</sup> Fatigue can cause a reduced ability to execute complex cognitive tasks, communicate effectively, quickly make appropriate decisions, and sustain a level of alertness required to carry out assigned duties, according to a 2021 DOD study on sleep deprivation and readiness.<sup>2</sup> The DOD study pointed out that, among active-duty personnel, fatigue appeared to be more the rule than the exception—rates of individuals sleeping less than 7 hours per night in the military were roughly twice of those in the civilian population.

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<sup>1</sup>See, for example, GAO, *Military Vehicles: Army and Marine Corps Should Take Additional Actions to Mitigate and Prevent Training Accidents*, [GAO-21-361](#) (Washington, D.C.: July 7, 2021) and *Navy Readiness: Additional Efforts Are Needed to Manage Fatigue, Reduce Crewing Shortfalls, and Implement Training*, [GAO-21-366](#) (Washington, D.C.: May 27, 2021). Also, see National Commission on Military Aviation Safety, *Report to the President and Congress of the United States* (Dec. 1, 2020). While officials told us the terms sleep deprivation and fatigue are often used interchangeably, sleep deprivation differs from fatigue in some respects. According to Department of Defense Instruction 1010.10, sleep deprivation is defined as obtaining inadequate sleep to support adequate daytime alertness. Department of Defense Instruction 1010.10, *Health Promotion and Disease Prevention* (Apr. 28, 2014) (incorporating change 3, effective May 16, 2022). According to the National Institute of Health and the National Institute for Occupational Safety and Health, fatigue is defined as a feeling of weariness, tiredness, or lack of energy, and it can be physical or mental. Sleep deprivation is a contributing factor to fatigue. For the purposes of this report, we will be focusing on sleep deprivation and referring to that as fatigue.

<sup>2</sup>Department of Defense, Report to Congressional Armed Services Committees, *Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces*, (Washington, D.C.: March 2021). DOD conducted this study in response to section 749 of the National Defense Authorization Act for Fiscal Year 2020. Pub. L. No. 116-92, § 749 (2019).

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DOD recognizes that impairment from fatigue can be equivalent to the effects of alcohol intoxication and significantly increases the risk of physical injury. The 2021 DOD study noted that leadership plays a significant role in limiting fatigue and called for DOD to promote a culture shift with regard to prioritizing adequate sleep in the military.

Our prior work has examined fatigue on Navy surface ships. In May 2021, we found that sailors were not receiving adequate sleep and the Navy lacked quality information on sailor fatigue and factors that caused a lack of sleep.<sup>3</sup> We made four fatigue-related recommendations, and in October 2023 we reported the Navy had implemented one of our four fatigue-related recommendations.<sup>4</sup> We found, for example, the Navy issued an instruction in September 2022 requiring systemic collection of quality and timely fatigue data from sailors that are accessible to operational commanders to support underway decision-making.<sup>5</sup> The Navy continues to work to address other recommendations we made.<sup>6</sup>

House Report 117-118, which accompanied a bill for the National Defense Authorization Act for Fiscal Year 2022, includes a provision for us to undertake a comprehensive review of DOD's efforts to limit sleep deprivation and manage fatigue across the military services.<sup>7</sup> This report assesses the extent to which (1) service members are getting adequate sleep, (2) DOD has addressed and managed service member fatigue, and (3) DOD has implemented fatigue-related recommendations from its 2021 study on sleep deprivation and readiness.

To address these objectives, we reviewed DOD and service guidance related to sleep and rest to determine the DOD and service recommended minimum amount of hours of sleep per night and rest

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<sup>3</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).

<sup>4</sup>GAO, *Navy Readiness: Challenges to Addressing Sailor Fatigue in the Surface Fleet Continue*, [GAO-24-106819](#) (Washington, D.C.: Oct. 11, 2023).

<sup>5</sup>Commander, U.S. Fleet Forces Command Instruction 5100.10A; Commander, U.S. Naval Forces Europe and Africa Instruction 5100.1D; and Commander, U.S. Pacific Fleet Instruction 5100.6A, *Fleet Safety and Occupational Health Program* (Sept. 12, 2022).

<sup>6</sup>The Navy is working to address recommendations to use collected data on sailor fatigue to identify, monitor, and evaluate factors that contribute to fatigue and inadequate sleep, and to take actions to address the factors causing sailor fatigue and inadequate sleep.

<sup>7</sup>H.R. Rep. No. 117-118, at 183 (2021).

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requirements and guidelines. We also reviewed DOD and service documentation, including health and safety-related surveys and reports, that included findings on the quantity and quality of service member sleep. We surveyed service members from several selected military occupations across the Air Force, Army, Navy, and Marine Corps with a high potential to be affected by fatigue: fixed-wing and rotary-wing pilots; remotely piloted aircraft pilots; aviation maintenance personnel; motor vehicle operators; and on-alert operations, such as nuclear missileers and watch floor officers.<sup>8</sup>

Specifically, we surveyed a nongeneralizable sample of service members in these occupations to gain insight into their sleep habits, factors that contribute to fatigue, and mitigations to manage fatigue.<sup>9</sup> We analyzed DOD, service, and occupation-specific policies, guidance, studies, and program documentation related to fatigue to understand the department's approach to manage fatigue and limit sleep deprivation. We also interviewed officials from the Office of the Secretary of Defense, including from the offices of the Under Secretary of Defense for Personnel and Readiness and the Assistant Secretary of Defense for Health Affairs, as well as officials from service headquarters, service safety centers, and major commands for the occupations selected in our review.

We conducted this performance audit from March 2022 to March 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>8</sup>These military occupations were surveyed, except for Army on-alert operations. For this group, we met with Army watch-floor officers. Additionally, our survey's selected occupations originally included Navy fixed-wing fighter and remote pilots. However, due to data discrepancies that we were unable to reconcile with the Navy, we were unable to survey them.

<sup>9</sup>We received responses from 245 in-scope service members from the 1,720 selected in our stratified random sample, for an unweighted response rate of 14.2 percent. See Appendix I for more details.

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## Background

### DOD and Service Fatigue-Related Policy and Guidance

Collectively, DOD and the services have several policies related to sleep and rest. The guidance generally emphasizes the importance of service members obtaining at least 7 hours of sleep for optimal performance and readiness.<sup>10</sup> DOD and the services have also issued policies and guidance requiring or recommending service members being given opportunities to rest—time where they are off duty and not performing work, including not performing administrative tasks.

The department's overarching fatigue-related guidance is contained in DOD Instruction 1010.10, which the department updated in May 2022.<sup>11</sup> The instruction states it is DOD policy to create a culture that views sleep patterns as a key indicator of readiness, to promote healthy sleep-wake cycles in operational and nonoperational environments, and to develop sleep strategies to maximize performance and alertness throughout DOD that are based on scientific evidence.<sup>12</sup> The instruction tasks the services with taking specific steps to help prevent and mitigate the effects of fatigue among service members by encouraging specific behavioral strategies to improve sleep, promoting a healthy sleep environment, and prioritizing time for sleep. For a list of service responsibilities, see table 1.

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<sup>10</sup>See, e.g., DOD Instruction 1010.10; Department of the Army Pamphlet 40-11, *Army Public Health Program* (May 18, 2020); Air Force Instruction 21-101, *Aircraft and Equipment Maintenance Management* (Jan. 16, 2020); and Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3120.2A, *Comprehensive Crew Endurance Management Policy* (Dec. 11, 2020). While the minimum amount of sleep recommended in DOD guidance is 7 hours, the majority of DOD and military service guidance and policies we reviewed require or recommend 8 hours of sleep.

<sup>11</sup>DOD Instruction 1010.10. Other DOD instructions also recognize the importance of sleep. For example, DOD Instruction 6490.05, *Maintenance of Psychological Health in Military Operations*, establishes requirements to prevent, identify, and manage adverse combat and operational stress reactions. Sleep is considered a protective factor against combat operational stress, and sleep restriction is considered a risk factor for symptoms of combat operational stress. The military departments are to implement policies and programs to enhance readiness, contribute to combat effectiveness, enhance the physical and mental health of military personnel, and prevent or minimize adverse effects associated with combat and operational stress.

<sup>12</sup>DOD considers circadian rhythm—the body's internal resting or wakefulness schedule over the course of a day—when creating policy related to sleep. For example, watchbills are schedules for when sailors stand watch. Circadian rhythm watchbills are designed so that sailors stand watch and sleep at the same time each day, allowing the body to follow its natural biological processes on a 24-hour cycle.



**Table 1: Military Service Responsibilities set forth in DOD Instruction 1010.10 to Help Prevent and Mitigate the Effects of Fatigue**

<b>Military Service Responsibility</b>
Encouraging behavioral strategies to improve sleep, such as mobile applications when allowed by operational requirements
Promoting a sleep environment that considers complete darkness, good ventilation, ambient temperatures, and low noise levels
Committing to at least 7 hours of uninterrupted sleep, as mission requirements permit, and incorporating adequate sleep recovery or planned naps when mission requirements result in unavoidable periods of sleep deprivation
Incorporating at least 7 hours of sleep per every 24-hour period into duty schedules, training plans, and battle plans <sup>a</sup>
Planning recovery time, including consideration for units to be placed “off cycle,” following periods of significant sleep deprivation <sup>a</sup>
Allowing additional sleep during the ramp-up period before a mission <sup>a</sup>
Supporting sleep extension following periods of high operations tempo <sup>a</sup>
Allowing at least 2 weeks of adaptation time for units deploying across six or more time zones with less than a 72-hour transit period <sup>a</sup>
Implementing, maintaining, funding, monitoring, and evaluating comprehensive and integrated health promotion and disease prevention programs and practices in accordance with the instruction and the total force fitness framework <sup>b</sup>
Coordinating health promotion initiatives to eliminate duplication of effort in achieving the strategies and priorities determined applicable to DOD

Source: Department of Defense (DOD) Instruction 1010.10, *Health Promotion and Disease Prevention* (Apr. 28, 2014) (incorporating change 3, effective May 16, 2022). | GAO-24-105917

<sup>a</sup>These responsibilities are to be implemented as mission requirements permit.

<sup>b</sup>Total Force Fitness is a framework intended to help maintain service members’ well-being and sustain their ability to carry out missions.

DOD Instruction 1010.10 also states it is DOD policy to use the Total Force Fitness framework as the methodology for understanding, assessing, and optimizing service members’ ability to meet mission requirements. This framework was implemented in 2009 as a key readiness component to help maintain service members’ well-being and sustain their ability to carry out missions.<sup>13</sup> The framework includes eight domains of health and performance, and sleep is embedded across several domains, including the physical, psychological, and medical dimensions, according to a Chairman of the Joint Chiefs of Staff instruction.<sup>14</sup> Since 2014, the services have had the responsibility to implement, maintain, fund, monitor, and evaluate related programs and practices in accordance with the Total Force Fitness framework.

<sup>13</sup>Guidance on Total Force Fitness is set forth in Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3405.01, *Chairman’s Total Force Fitness Framework* (Sept. 1, 2011) (current as of Sept. 23, 2013).

<sup>14</sup>The eight domains of health and performance are: physical, environmental, medical and dental, nutritional, spiritual, psychological, behavioral, and social. CJCSI 3405.01.

In addition, DOD and the services have issued guidance documents that address fatigue for service members in specific occupations. For example, the Navy and Air Force have issued guidance directed at service members serving as aircrew (i.e., pilots and other service members working on airplanes while they are in flight).<sup>15</sup> The Navy and Air Force guidance for aircrew set requirements for free time and include time for meals, transportation, and an opportunity for at least 8 hours of uninterrupted sleep. Other occupations have similar requirements or guidelines. For example, operators of government-owned motor vehicles, Army Corps of Engineers equipment operators, and Air Force maintenance personnel have mandated rest periods and limits in the amounts of hours they can work. See table 2 for examples.

**Table 2: Examples of Department of Defense Occupation-Specific Sleep, Rest, and Duty Hour Requirements and Guidelines**

Occupation	Requirement or Guideline
Army Corps of Engineers Equipment Operators	Operators shall not exceed 12 hours of duty time in any 24-hour period, including time worked at another occupation; operators also require a minimum of 8 consecutive hours of rest between shifts in a 24-hour period.
Army Air Traffic Controllers	An 8-hour continuous shift is standard, and the maximum duty day is not to exceed 10 hours for nonstandard shifts. Air Traffic controllers have a 40-hour work week; however, they may have a maximum 50-hour work week for a period not to exceed 60 days. They are given an uninterrupted 8-hour rest period prior to each shift and must be relieved of all duties for 24 consecutive hours at least once during each 7-day period.
Air Force Maintenance Personnel	Maintenance personnel receive a rest period after each shift, including during exercises or inspections. A rest period is a block of time that gives a person the opportunity for 8 hours of uninterrupted sleep in a 24-hour period.
Navy and Air Force Aircrew	Aircrew typically receive a 12-hour rest opportunity prior to beginning the flight duty period. This crew rest is free time and includes time for meals, transportation, and an opportunity for at least 8 hours of uninterrupted sleep.
Army Assault Helicopter Battalions	Helicopter units establishing a main command post implement a sleep plan within 4 hours of occupation of the command post.
Munitions and Missile Maintenance Management	Personnel handling, loading, or performing maintenance actions on nuclear or conventional weapon systems or explosives may not exceed 12 hours of continuous duty followed by a period which provides at least 8 hours of uninterrupted rest before starting the next duty shift.
Vehicle Operators	Vehicle operators must have the opportunity for 8 consecutive hours of rest during any 24-hour period.
Army and Marine Corps Vehicle Operators	Vehicle operators shall be provided at least 8 consecutive hours of rest during any 24-hour period. Vehicle operators will not drive more than 10 hours in a duty period (including rest and meal breaks). Mission-essential shifts longer than 10 hours require specific risk-mitigations.

<sup>15</sup>Commander, Naval Air Forces (CNAF) Manual 3710.7, *NATOPS General Flight and Operating Instructions Manual* (July 15, 2017) and Air Force Manual (AFMAN) 11-202, vol. 3, *Flight Operations* (Jan. 10, 2022).

Occupation	Requirement or Guideline
Navy Surface Force Sailors	Surface Force sailors must be given the opportunity to obtain a minimum of 7.5 hours of sleep in a 24-hour day, either by one uninterrupted 7.5-hour period or an uninterrupted 6-hour period with an uninterrupted 1.5-hour nap.

Sources: Army Corps of Engineers Engineer Manual 385-1-1, *Safety and Health Requirements* (Nov. 30, 2014); Army Regulation 95-2, *Air Traffic Control, Airfield/Heliport, and Airspace Operations* (Mar. 31, 2016); Air Force Instruction 21-101, *Aircraft and Equipment Maintenance Management* (Jan. 16, 2020); Air Force Manual 11-202, vol. 3, *Flight Operations* (Jan 10, 2022); Commander, Naval Air Forces (CNAF) Manual 3710.7, *NATOPS General Flight and Operating Instructions Manual* (July 15, 2017); Army Field Manual 3-04.113, *Utility and Cargo Helicopter Operations* (Dec. 2007); Air Force Manual 21-200, *Munitions and Missile Maintenance Management* (Aug. 9, 2018) (certified current, May 9, 2022); Army Regulation 385-10, *The Army Safety and Occupational Health Program* (July 24, 2023); Marine Corps Order 5100.29C, *Marine Corps Safety Management System*, Vol. 3, *Marine Corps Traffic Safety Program* (Oct. 15, 2020); Commander, Naval Surface Force, U.S. Pacific Fleet, and Commander, Naval Surface Force Atlantic Instruction 3120.2A, *Comprehensive Crew Endurance Management Policy* (Dec. 11, 2020). | GAO-24-105917

**DOD Organizations Involved in Managing Service Member Fatigue**

Fatigue management stretches across DOD and the services in multiple domains—including health, risk, and readiness—and multiple entities at the DOD and service-level have fatigue-related responsibilities to manage fatigue, conduct research, and develop mitigations and potential solutions. For example:

**The Office of the Under Secretary of Defense for Personnel and Readiness.** This office oversees the implementation of DOD Instruction 1010.10, which contains the department’s overarching fatigue-related guidance. The Office of the Under Secretary of Defense for Personnel and Readiness also authored the 2021 DOD study on sleep deprivation and readiness.

**The Office of the Assistant Secretary of Defense for Health Affairs.** This office supports the Assistant Secretary of Defense for Health Affairs in their role as the principal advisor to the Secretary of Defense for all DOD health and force health protection policies, programs, and activities, including those related to sleep and fatigue.

**Defense Health Agency.** This organization is a joint Combat Support Agency that works with the Army, Navy, and Air Force medical services. The organization provides support for medical research, development, education, and training, as well as public health, including support related to sleep and fatigue.

**Military Research Centers.** The military departments conduct research on approaches and technologies to help optimize human performance, including managing and limiting service member fatigue.<sup>16</sup>

<sup>16</sup>These centers include the Defense Centers for Public Health-Aberdeen (formerly U.S. Army Public Health Center); the Air Force Medical Service, Air Force Research Laboratory, 711<sup>th</sup> Human Performance Wing; and the Navy Bureau of Medicine and Surgery, Navy Medical Research Command, Naval Health Research Center.

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**Force Safety and Occupational Health.** This office develops Occupational Safety and Health policy and provides oversight of the DOD components, in accordance with DOD's policy to protect DOD personnel from accidental death, injury, or occupational illness, including incidents related to fatigue.<sup>17</sup> The office has reported that DOD is focusing on human fatigue issues and sleep deprivation monitoring as a leading indicator of mishaps.<sup>18</sup>

**Defense Safety Oversight Council.** This organization is chaired by the Under Secretary of Defense for Personnel and Readiness to provide governance on DOD-wide efforts to reduce mishaps, incidents, and occupational illnesses and injuries—which would include those resulting from fatigue.

**Joint Safety Council.** The council focuses on mitigating safety risks and reducing mishaps in operational and training settings. The council advises the Secretary of Defense through the Defense Safety Oversight Council on the safety of military operations and related regulations and policy reforms.

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## Information on Selected Military Occupations







A variety of characteristics specific to military occupations may contribute to service member fatigue, including extended shifts, night operations, high noise environments, operating heavy equipment, and high operational tempo. We used these characteristics to select six general military occupations across the services with the potential to be affected by fatigue for our review (see fig. 1). We surveyed or met with service members in each of these occupations to gain insight into their sleep habits, factors that contribute to fatigue, and mitigations to manage fatigue.

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<sup>17</sup>Department of Defense Instruction 6055.01, *DOD Safety and Occupational Health (SOH) Program* (Oct. 14, 2014) (incorporating change 3, effective Apr. 21, 2021) and Department of Defense, *Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces* (March 2021).

<sup>18</sup>A DOD mishap is an unplanned event or series of events that results in: damage to DOD property, occupational illness to DOD personnel, injury to on- or off- duty DOD military personnel, injury to on-duty DOD civilian personnel, damage to public or private property, or injury or illness to non-DOD personnel caused by DOD activities. Department of Defense Instruction 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping* (June 6, 2011) (incorporating change 2, June 11, 2019).

**Figure 1: GAO Selected Military Occupations, by Service**

						
	Fixed-wing pilots	Rotary-wing pilots	Remote pilots	Aviation maintainers	On-alert operations	Motor vehicle operators
Army		✓	✓	✓	✓	✓
Navy		✓		✓		
Marine Corps	✓	✓	✓	✓		✓
Air Force	✓	✓	✓	✓	✓	

Source: Military occupations selected for GAO survey on service member fatigue; U.S. Air Force/Staff Sgt. C. Callaway, U.S. Air Force/Senior Airman D. Donaldson, U.S. Air National Guard/Staff Sgt. B. Rizor, U.S. Marine Corps/Sgt. R. Jacquotte, U.S. Marine Corps/Cpl. T. W. Stewart, and U.S. Navy/O. Wood (photos). | GAO-24-105917

Note: We had originally included Navy fixed-wing fighter and remote pilots in our selected occupations to survey. However, due to data discrepancies that we were unable to reconcile with the Navy, we were unable to survey them. The service and military occupations shown were surveyed, except for Army on-alert operations. For this group, we met with Army watch-floor officers.

## Many Service Members Not Getting DOD Recommended 7 or More Hours of Sleep Each Day

### DOD and Service Surveys Show Service Members Are Not Getting Enough Sleep

DOD and the services have administered and reported the results of surveys on service member fatigue for over a decade, consistently finding that service members report not getting the DOD recommended 7 or more hours of sleep each day or report getting poor quality of sleep.

**DOD-wide surveys.** DOD administers surveys related to health and safety behaviors to all active-duty service members on an annual and

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periodic basis.<sup>19</sup> Estimates from DOD’s periodic survey—the Health Related Behaviors survey—remained consistent, showing that between 2005 and 2018, the most recent data available, approximately one-third of service members reported sleeping 7 or 8 hours per night, while the majority of service members reported sleeping 6 or fewer hours per night, and approximately one-third of service members rate their sleep as fairly bad or very bad.<sup>20</sup>

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<sup>19</sup>Annual surveys include the Periodic Health Assessment, which is an annual screening tool to evaluate individual medical readiness of service members. It includes a self-reported health status that contains questions regarding sleep health. Healthcare providers use the survey responses to care for service members. Periodic surveys include the Health Related Behaviors Survey, which anonymously gathers data to understand the health, health-related behaviors, and well-being of service members, including their sleep health.

<sup>20</sup>RAND Corporation, *2018 Department of Defense Health Related Behaviors Survey (HRBS). Results for the Active Component*. (Santa Monica, CA: RAND Corporation, 2021). RAND Corporation, *2015 Department of Defense Health Related Behaviors Survey (HRBS)* (Santa Monica, CA: RAND Corporation, 2018). ICF International, *2011 Department of Defense Health Related Behaviors Survey of Active Duty Military Personnel* (Fairfax, VA: ICF International, 2013). Research Triangle Institute International (RTI International), *2008 Department of Defense Survey of Health Related Behaviors Among Active Duty Personnel. A Component of the Defense Lifestyle Assessment Program (DLAP)* (Research Triangle Park, NC: RTI International, 2009). Research Triangle Institute International (RTI International), *2005 Department of Defense Survey of Health Related Behaviors Among Active Duty Personnel. A Component of the Defense Lifestyle Assessment Program (DLAP)* (Research Triangle Park, NC: RTI International, 2006).

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### Safety Surveys Identify Fatigue

Safety surveys are designed to identify and correct conditions and human factors to prevent future mishaps. The Army, Navy, Marine Corps, and Air Force administer safety surveys when command leadership changes and communicate findings to the new command leadership. These surveys include open-ended questions that focus on safety, climate, and culture, such as:

- “the next mishap / near-miss in my organization will be caused by,” and
- “the most significant action(s) my organization can take to improve safety is/are.”

Since 2017, service members have often identified fatigue as a concern within their unit. In several instances, respondents for safety surveys administered by the Navy and Marine Corps cited fatigue as one of the top five concerns from which the next mishap will occur.

Source: Military service documentation. | GAO-24-105917

**Service-specific surveys.** The services also administer surveys on an annual and periodic basis. One annual survey—the Azimuth Check, reported in the Army’s Health of the Force report—found that over the past 5 years between 34 and 39 percent of active-duty soldiers who completed the survey reported 7 or more hours of sleep per night during the work week, while the majority reported 6 hours or fewer.<sup>21</sup> Some of the services’ other surveys identified factors affecting sleep, such as uncomfortable mattresses and workload.<sup>22</sup> The services also conduct periodic surveys of service members in combat environments, and a 2012 joint Army and Marine Corps team found that about 27 percent of deployed soldiers responding to the survey reported having high or very high concern that they are not getting enough sleep. The 2012 survey also found that about 6 percent of deployed soldiers responding to the survey reported making a mistake or having an accident due to sleepiness.

**Service safety surveys.** The Army, Navy, Marine Corps, and Air Force administer safety surveys that include questions on crew rest policies, rest, and fatigue. Our analysis of Navy, Marine Corps, and Air Force safety survey results found that fatigue is frequently cited by service members in response to a question asking about causes of the next incident or mishap in their unit (see sidebar).

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## GAO Survey Results Identify Inadequate Sleep for Service Members and Other Fatigue Issues

Our analysis of responses from a nongeneralizable sample of 190 officers we surveyed from selected military occupations that have a high likelihood of experiencing fatigue found that many respondents are

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<sup>21</sup>Defense Centers for Public Health-Aberdeen, *2022 Health of the Force: Create a Healthier Force for Tomorrow*, (2022). U.S. Army Public Health Center, *2021 Health of the Force: Create a Healthier Force for Tomorrow*, (2021). U.S. Army Public Health Center, *2020 Health of the Force: Create a Healthier Force for Tomorrow*, (2020). U.S. Army Public Health Center, *2019 Health of the Force: Create a Healthier Force for Tomorrow*, (2019). U.S. Army Public Health Center, *2018 Health of the Force: Create a Healthier Force for Tomorrow*, (2018).

<sup>22</sup>Commander, Naval Surface Forces, Commander, Naval Surface Force, U.S. Pacific Fleet (N05), *Afloat Safety Climate Assessment Survey FY22 Insights*, (Coronado, CA, 2022). Commander, Naval Surface Forces, *On Surface Warfare: Summary of 2022 Officer Surveys*.

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sleeping too little, and roughly half of respondents have poor sleep quality regardless of quantity.<sup>23</sup>

More specifically, we found that the majority of respondents, roughly 67 percent (127 of 190), reported sleeping 6 to 7 hours per night, while 26 percent of respondents (50 of 190) reported sleeping less than 6 hours per night, as shown in figure 2. Additionally, 46 percent of respondents (87 of 190) rated the quality of their sleep during the work week as moderately poor and 4 percent (eight of 190) rated it as extremely poor, as shown in figure 2.

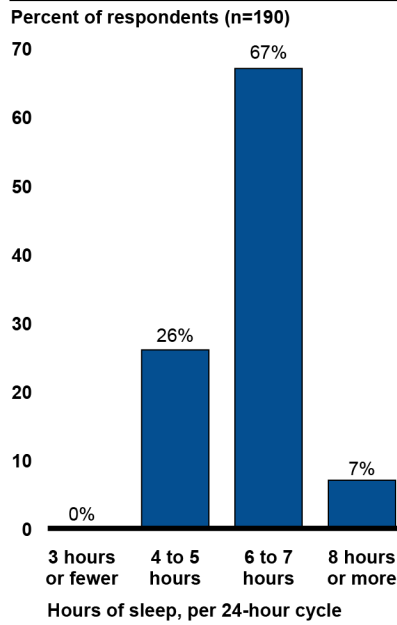
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<sup>23</sup>We conducted an analysis of the 245 survey responses to identify sources of nonresponse bias that could lead to potential misrepresentations in the interpretation of the results. We identified differences in both response rates and distributions for all subpopulations we examined and found officers had a significantly higher response rate (22.2 percent) and were overrepresented when compared to enlisted service members. Because the response rate for enlisted service members was so low (6.4 percent), we chose to use responses only from officers in summarized results to avoid potential misrepresentations. Additionally, the number of responses reported may vary due to skip patterns in the questionnaire or respondents choosing not to answer a particular question (item nonresponse).

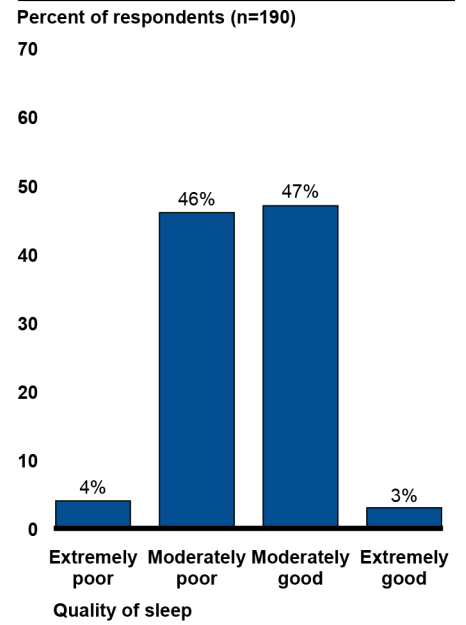


**Figure 2: GAO Survey Officer Respondents on Hours and Quality of Sleep, per 24-Hour Cycle**

*Over the last six months, how many hours of sleep, on average, did you typically get each day during your work week?*



*Over the last six months, which of the following best describes the quality of your sleep during your work week?*



Source: GAO survey results. | GAO-24-105917

Note: GAO survey results are from a nongeneralizable sample of officers in occupations selected because they have a high likelihood of experiencing fatigue.

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### Reflections From Survey Respondents on Collateral Duties

“Combine [primary duties] with the plethora of duties and programs a UAS [Unmanned Aircraft System] Warrant Officer is responsible for and you are generally sleep deprived always.”

– *Army remote pilot*

“Collateral duties in addition to flying significantly increase workload for most pilots, myself included. Sleep policies apply specifically to the night before flying events. Days where the pilot is not flying are effectively unregulated in terms of crew day and crew rest. The result is planned periods of sleep deprivation in order to accomplish tasks that accumulate due to the need to adhere to the letter of policies regarding crew day and crew rest when flying.”

– *Marine Corps fighter pilot*

“Sleep deprivation has an underlying cause from the workload Marine pilots are faced with. There are so many programs that are mandated for each squadron to support and not enough personnel, causing military trained pilots to be working in positions that take them out of the cockpit and study material.”

– *Marine Corps helicopter pilot*

“Being required to complete tasks during or immediately following an alert week makes it extremely difficult to perform well on a task. The tasks are usually doable, however, the quality of the output is easily affected by alert related duties and or sleep deprivation from lack of a concrete schedule.”

– *Air Force missileer*

Source: GAO survey, selected written responses. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

Respondents to our survey identified several factors that negatively influence sleep during their work week, including primary duty requirements, collateral duty requirements, and high pace of operations (see sidebar). Respondents also identified medical issues, such as sleep apnea, that affect their ability to get enough sleep.

Moreover, we found the sleep environment is difficult to manage when service members are deployed. Twenty-one percent (38 out of 181) of respondents had been deployed within the past 6 months of taking our survey. These respondents reported the issues of temperature, exposure to light, and bedding as most interruptive of sleep while on deployment. For example, one survey respondent stated, “The mattresses are not comfortable, and external noise from the console or your crew partner (e.g., alarms, phone calls, fans to keep equipment cool) can keep/wake you up.”

Survey respondents provided a range of examples of how sleep deprivation has affected their work (see fig. 3). See appendix II for additional responses from our survey.

**Figure 3: Survey Responses on the Effects of Sleep Deprivation**

**Please provide an example of how sleep deprivation has affected your work.**

 <p><b>Fixed-wing pilots</b></p>	<p>“Somewhat limited ability at times to be fully engaged in a flying scenario or monitoring a student pilot as much as I should.”</p> <p>“Could tell cognitive abilities were decreased due to lack of sleep.”</p> <p>“Difficulty focusing, slower reaction times...”</p>
 <p><b>Rotary-wing pilots</b></p>	<p>“Difficulty concentrating, processing problems takes longer...”</p> <p>“Slow reactions, slow recall of memory or just can't remember normal things regarding work...”</p> <p>“Delayed reaction in the aircraft...”</p> <p>“Mistakes, errors and oversights due to distraction from being fatigued, or at the end of a caffeine crash.”</p> <p>“Not as sharp when flying. Takes longer to perform tasks (checklists, communication with ATC, diagnosing problems, etc.)”</p>
 <p><b>Remote pilots</b></p>	<p>“Slow reaction time. Almost collided with another aircraft due to mental fatigue. Incident occurred around 0230 local.”</p> <p>“I sit in a dark container late in the night, some days it takes everything I have to keep my eyes open. Sometimes my sensor falls asleep and I have to wake them up every time instructions come over the headset.”</p> <p>“Sleeping on shift, needing a break from flying to take a power nap, unable to wake up fully during shift times, lower quality performance.”</p> <p>“Dragging, slower comprehension, lack of focus.”</p>
 <p><b>Aviation maintainers</b></p>	<p>“Slower response and processing times. Leads to greater possibility of mistakes made while sleep deprived. Being more irritable makes quality of work decrease.”</p> <p>“Not being able to concentrate.”</p>
 <p><b>On-alert operations</b></p>	<p>“The mattresses are not comfortable, and external noise from the console or your crew partner (e.g. alarms, phone calls, fans to keep equipment cool) can keep/wake you up... we have additional training to complete during regular duty hours, which makes it difficult to constantly change sleep cycle to take night shifts.”</p> <p>“We were in the capsule doing a major op, had to be awake for about 16 straight hours when we were directed to make some document changes, was so tired that i made several mistakes that needed to be corrected later.”</p> <p>“Inability to focus, memory issues, brain fog, drowsiness, trouble concentrating.”</p>
 <p><b>Motor vehicle operators</b></p>	<p>“Sometimes when I'm driving, I find myself falling asleep and i have to catch myself. I could kill someone on accident because I'm not getting the right sleep. I recognize that now imagine someone who doesn't recognize they aren't getting enough sleep and end of killing someone.”</p> <p>“While in a field training exercise, sleep is not a priority, which, in my opinion, should be the time where it should be of utmost priority... sleep issues are not forecasted or taken into consideration in the slightest when we drive at night. I believe it is extremely dangerous to have Soldiers operating heavy equipment, on rough terrain, in the dark while being sleep deprived...”</p>

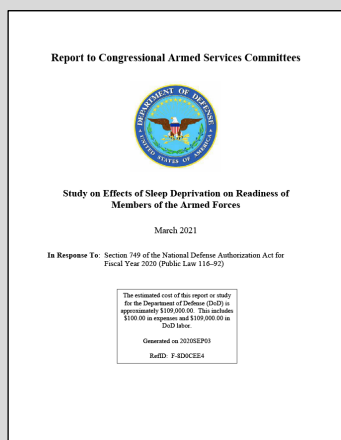
Source: GAO survey responses (selected written comments); photos provided by U.S. Air Force/Staff Sgt. C. Callaway, U.S. Air Force/Senior Airman D. Donaldson, U.S. Air National Guard/Staff Sgt. B. Rizer, U.S. Marine Corps/Sgt. R. Jacquotte, U.S. Marine Corps/Cpl. T. W. Stewart, and U.S. Navy/O. Wood. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

## DOD Recognizes the Risks of Sleep Deprivation

### 2021 Department of Defense (DOD) Study on Effects of Sleep Deprivation on Readiness

The National Defense Authorization Act for Fiscal Year 2020 required DOD to complete a study that included: 1) a standardized definition of sleep deprivation; 2) an assessment of the prevalence of sleep deprivation; 3) an assessment of whether there may be a relationship between sleep deprivation and medical conditions such as Traumatic Brain Injury, Post-Traumatic Stress Disorder, and depression; and 4) recommendations.



In March 2021 DOD provided a report on the results of its study to the Congressional Armed Services Committees, noting that sleep may be the most important biological factor that determines service member health and combat readiness. DOD recommended that the department establish policy to promote a culture shift to prioritize adequate sleep in the military and identified a number of strategies to mitigate the risk of sleep deprivation and improve sleep among service members.

Source: DOD, Report to Congressional Armed Services Committees: Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces (March 2021). | GAO-24-105917

DOD has long recognized the harmful effects of poor or inadequate sleep. In 2021, DOD conducted a study on the effects of sleep deprivation on readiness and reported its results to the congressional armed services committees (see sidebar). In the study, DOD stated sleeping less than 7 hours per night can have significant effects on cognitive, emotional, and physical capabilities that directly affect military performance. These effects include deficits in marksmanship, physical training, decision-making, and risk-taking behavior. DOD and the services recognize that impairment from sleep deprivation can be equivalent to the effects of alcohol intoxication and significantly increases the risk of physical injury. For example, Navy guidance cautions that getting less daily sleep than the minimum requirement can rapidly and significantly degrade alertness and performance, which can lead to mishaps and numerous negative health outcomes.<sup>24</sup> Navy data show that sailor effectiveness declines after prolonged periods without sleep, equating to impairment levels comparable to intoxication.

The services also recognize that sleep deprivation affects medical and force readiness and has financial implications. For example, Navy guidance states that less than 6 hours of sleep per night can lead to

<sup>24</sup>Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3120.2A, *Comprehensive Crew Endurance Management Policy* (Dec. 11, 2020).

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service members being more prone to systemic heat injuries.<sup>25</sup> Army Holistic Health and Fitness system documentation outlines that chronic sleep deprivation contributes to medically nondeployable status of service members.<sup>26</sup>

The services have also reported that lack of sleep can lead to mishaps—incidents that result in death, injury, illness or property damage. Mishaps can range from an aircraft crash to an ankle sprain at work. For example:

- The Army has found that fatigue, lack of rest, or lack of sleep was a cause in 8 percent of tactical vehicle accidents between fiscal years 2010 to 2019.<sup>27</sup>
- The Naval Safety Center found that between 2015 and 2019 there were 489 reported instances of fatigued-driving related fatalities, serious injuries, and property damage involving Marines and sailors.
- In 2017, the Navy had four significant mishaps at sea, including two collisions that resulted in the loss of 17 sailors' lives and hundreds of millions of dollars in damage to Navy ships, which the Navy attributed partly to sailor overwork and fatigue.<sup>28</sup> According to Navy guidance, after sailors have been awake for 18 hours, their performance, efficiency, and decision-making ability rapidly decline to 75 percent of baseline effectiveness or less, and accident rates increase for almost every activity.<sup>29</sup>

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<sup>25</sup>Office of the Chief of Naval Operations Instruction 5100.19F, *Navy Safety and Occupational Health Program Manual for Forces Afloat* (May 9, 2019).

<sup>26</sup>The U.S. Army Holistic Health and Fitness Operating Concept, *The U.S. Army's System for Enhancing Soldier Readiness and Lethality in the 21st Century* (Oct. 1, 2020).

<sup>27</sup>In 2021, we found that the Army and Marine Corps reported 3,753 tactical vehicle accidents (e.g., tanks, trucks) from noncombat scenarios resulting in 123 service member deaths from fiscal years 2010 to 2019. GAO, *Military Vehicles: Army and Marine Corps Should Take Additional Actions to Mitigate and Prevent Training Accidents*, [GAO-21-361](#) (Washington, D.C.: July 7, 2021).

<sup>28</sup>We have reported that the Navy has since acted to address sailor fatigue, resize surface ship crews to handle workload, and improve training in the surface fleet. See 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) and GAO, *Navy Readiness: Challenges to Addressing Sailor Fatigue in the Surface Fleet Continue*, [GAO-24-106819](#) (Washington, D.C.: Oct. 11, 2023).

<sup>29</sup>Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3120.2A, *Comprehensive Crew Endurance Management Policy* (Dec. 11, 2020).

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More recently, as required by the National Defense Authorization Act for Fiscal Year 2022, DOD established the Suicide Prevention and Response Independent Review Committee to conduct a comprehensive review of suicide prevention and response programs and found that sleep disruption was a risk factor for suicide. The committee issued a report, and among its 127 recommendations, seven are related to sleep, including providing education on healthy sleep habits during military training and regularly scheduled unit formations. The report also had a high-priority recommendation that duty schedules allow for 8 hours of sleep and minimize the frequency of shift changes.<sup>30</sup>

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## DOD Has Taken Steps to Address Fatigue, but Faces Challenges with Oversight and Enterprise-Wide Collaboration

DOD and the services have taken steps to address fatigue, such as conducting research and implementing strategies to limit sleep deprivation. However, we found challenges with DOD's approach to overseeing and leading the department's fatigue related efforts, fragmented fatigue-related research efforts, and information sharing across the department.

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## DOD and the Services Have Taken Steps to Address Fatigue

DOD and the services have taken several steps to address fatigue. These steps, as shown in figure 4, include developing policies and guidance on sleep and fatigue management, conducting research, implementing several strategies to limit and manage sleep deprivation, educating and training service members, and analyzing fatigue-related mishap data.

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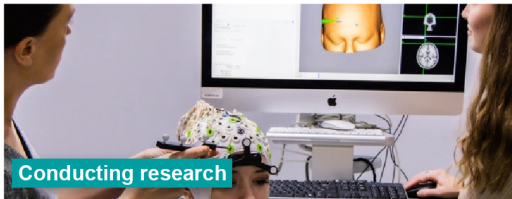
<sup>30</sup>A Secretary of Defense memorandum related to the report's recommendations directed commanders at all levels to promote mission readiness through healthy sleep throughout the department, in accordance with DOD Instruction 1010.10, among other things. Secretary of Defense Memorandum, *Next Steps on Suicide Prevention in the Military* (Mar. 16, 2023).

**Figure 4: Examples of Steps DOD and the Services Have Taken to Address Fatigue**



**Developing policies and guidance**

DOD and the services have taken steps to update or revise policies to incorporate sleep-related considerations. For example, in May 2022, the department's overarching fatigue-related guidance was updated to task the services with taking specific steps to help prevent and mitigate the effects of fatigue among service members.<sup>a</sup> In another example, Army officials told us they updated a field manual based on sleep-related recommendations made in previous reports.<sup>b</sup> Officials stated the reports highlighted the importance of sleep, which led to the Army including sleep and sleep leadership in the field manual.



**Conducting research**

DOD and the services have a number of organizations that collect data on the quantity and quality of sleep and study mitigations to limit sleep deprivation and manage fatigue, including the Walter Reed Army Institute of Research, the Air Force 711th Human Performance Wing's Signature Tracking for Optimized Nutrition and Training Lab, the Naval Health Research Center, and the Naval Postgraduate School. Additionally, individual units collect sleep data in an effort to help service members become more aware of their personal sleep habits.



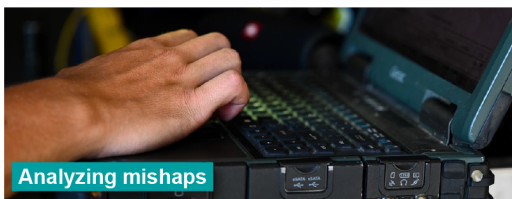
**Implementing mitigation strategies**

DOD and the services have implemented a variety of mitigation strategies to address service member fatigue due, in part, to disturbances in circadian rhythm (e.g., traveling across multiple time zones); mission-related unstable sleep practices (e.g., shiftwork, 24-hour duty assignments); uncomfortable or otherwise inhospitable sleeping environments (e.g., noise, bedding, temperature); or medical-related issues (e.g., sleep apnea, insomnia). Such mitigations include adjustments to scheduling practices, environmental solutions such as blackout curtains, and tactical napping, which according to service documentation, are brief periods of sleep that restore and sustain service member readiness and performance.



**Disseminating training and awareness campaigns**

DOD and the services have training and awareness campaigns to educate service members on sleep, health, and fatigue. For example, the Army has added human performance teams to brigades to share information about sleep, along with information on physical, mental, spiritual, and nutritional wellness. The Navy Surface Warfare Officers School Command added 2 weeks of training on fatigue, crew endurance, and stress management to the Surface Commanders course. The Air Force currently has 26 Operational Support Teams—which provide training on sleep and fatigue prevention, among other things—embedded within operational units for 4-6 months at a time.



**Analyzing mishaps**

DOD and the services are working to ensure that mishap data includes detailed human factors analysis codes, including codes for fatigue to allow for accurate mishap trending, efficient hazard analysis, and more effective sharing of lessons learned. DOD anticipates new safety data standards to be implemented by February 2024 and is working on revisions to clarify the Office of the Secretary of Defense's responsibilities for mishap analysis.<sup>c</sup>

Source: GAO analysis of Department of Defense (DOD) documentation and interviews; DOD/G. A. Riis, U.S. Army/T. Breaux, DOD/Sgt. T. Curry, U.S. Navy/C. Tucker, U.S. Air Force/Senior Airman M. Smith (photos). | GAO-24-105917

<sup>a</sup>Department of Defense Instruction 1010.10, *Health Promotion and Disease Prevention* (Apr. 28, 2014) (incorporating change 3, effective May 16, 2022).

<sup>b</sup>Army Field Manual FM 7-22, *Holistic Health and Fitness* (Oct. 8, 2020).

<sup>c</sup>We reported in 2018 that DOD needs to improve its approach for collecting and analyzing data on military aviation mishaps to manage risks, and recommended that the Office of the Under Secretary of Defense for Personnel and Readiness ensure standardized aviation mishap data elements are collected by the military safety centers. See GAO, *Military Aviation Mishaps: DOD Needs to Improve Its Approach for Collecting and Analyzing Data to Manage Risks*, [GAO-18-586R](#) (Washington, D.C.: Aug. 15, 2018).

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## DOD Faces Oversight and Enterprise-Wide Collaboration Challenges in Leading Fatigue-Related Efforts

### Oversight Challenges

DOD faces challenges with overseeing and leading the department's fatigue-related efforts, and overseeing the services' implementation of their responsibilities related to preventing and mitigating the effects of fatigue. We also identified areas where some fatigue-related efforts were fragmented across the department and where DOD could better facilitate collaboration between DOD entities and stakeholders.

We found challenges with DOD's approach to overseeing and leading the department's fatigue-related efforts, including challenges with (1) organizational authority, (2) the framework used to implement and oversee fatigue-related efforts, and (3) overseeing the services' implementation of their responsibilities to help prevent and mitigate the effects of fatigue.

First, we identified challenges with organizational authority for overseeing and leading the implementation of DOD's overarching fatigue-related guidance. DOD Instruction 1010.10 assigns responsibility to oversee the implementation of the instruction, which includes provisions related to fatigue prevention and mitigation, to the Under Secretary of Defense for Personnel and Readiness. Personnel and Readiness officials told us that primary oversight and leadership responsibility for the Instruction had been delegated to the Office of the Assistant Secretary of Defense for Health Affairs (Health Affairs). However, our analysis found that sleep is related to other efforts in domains other than health, and Health Affairs does not have organizational authority over all the domains we identified.

For example, Health Affairs does not have organizational authority over the Office of the Assistant Secretary of Defense for Readiness, which has offices for Force Safety and Occupational Health and Force Education and Training, and sleep relates to responsibilities in both offices. Similarly, Health Affairs also does not have organizational authority over the Office of the Assistant Secretary of Defense for Human Resource Activity, which oversees the Defense Suicide Prevention Office. The Defense Suicide Prevention Office provides resources to service members on preventing sleep deprivation, as sleep deprivation is considered a risk factor for suicide. Additionally, Health Affairs officials with whom we spoke did not have details on how they would carry out their delegated responsibilities in coordination with these offices.



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**Challenges with the Department of Defense (DOD) Total Force Fitness Framework**

In 2017, DOD commissioned a report to examine Total Force Fitness. The report found it could not determine the degree of execution of Total Force Fitness and that DOD lacked sufficient guidance to implement the programs.

Following that report, DOD made more than two dozen recommendations to improve Total Force Fitness; however, DOD could not provide us a status update on those recommendations, and we could not determine how many, if any, had been addressed. For example, one recommendation was to create a DOD directive to establish policy, assign responsibilities, and delegate authority to DOD components for Total Force Fitness implementation. However, 6 years later the directive is still not complete, and officials did not have an estimate for its completion.

Source: GAO analysis of DOD documentation. | GAO-24-105917

Second, we identified challenges with the framework used to implement and oversee the department's fatigue-related guidance.<sup>31</sup> In May 2022, DOD issued an update to DOD Instruction 1010.10 to (1) identify Total Force Fitness as the framework to understand, assess, and optimize service members' well-being and (2) promote healthy sleep-wake cycles in operational and nonoperational environments.<sup>32</sup> DOD officials told us they use Total Force Fitness as the primary method to implement the added fatigue-related requirements to help prevent and mitigate the effects of sleep deprivation among service members. However, DOD has reported on, and officials on this review acknowledged, challenges with the implementation of Total Force Fitness, including insufficient guidance and unclear authority and responsibilities to implement the programs under the framework (see sidebar).<sup>33</sup> DOD and service officials we spoke to were either unaware of who or which office had fatigue-related responsibilities or believed another official or office had assumed fatigue responsibilities when they had not. For example, officials were unclear if sleep was related to medical or force readiness, or both, and officials in both domains were divided on the interpretation.

Third, we identified challenges with overseeing the services' individual fatigue-related responsibilities, as outlined in DOD Instruction 1010.10. Specifically, Health Affairs officials told us they have not been able to identify service-level officials, including service points of contact, responsible for or aware of the services' implementation of the responsibilities set forth in DOD Instruction 1010.10. Over the course of this review, we were also unable to identify service officials responsible for these fatigue-related responsibilities.

Officials from each of the four services we spoke to in the safety or health domains were unaware of the DOD instruction or the responsibilities it sets forth. The instruction directs DOD component heads to help prevent and mitigate the effects of fatigue among service members by promoting

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<sup>31</sup>DOD Instruction 1010.10.

<sup>32</sup>Started in 2009, DOD's Total Force Fitness is a framework intended to maintain service members' well-being and to sustain their ability to carry out missions. The framework includes eight domains, and sleep is embedded across several domains, according to program documentation. The eight domains are: physical, environment, medical and dental, nutritional, spiritual, psychological, social, and financial.

<sup>33</sup>Defense Systems Technical Area Tasks, Booz Allen Hamilton, *Total Force Fitness Capabilities-Based Assessment Final Report*, a report prepared at the request of the Office of the Under Secretary for Defense for Acquisition, Technology and Logistics, Department of Defense (Apr. 27, 2017).

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and encouraging service members to obtain adequate sleep through a variety of means, including using mobile applications to track sleep and promoting a healthy sleep environment. DOD Instruction 1010.10 also directs component heads to prioritize time for sleep and fatigue prevention as mission requirements permit by incorporating at least 7 hours of sleep per every 24-hour period into duty schedules, training plans, and battle plans, and allowing additional sleep for service members during preparation and periods before a mission, among other things.

It is DOD policy to enhance mission readiness, unit performance, and the health and fitness of service members by creating a culture that views sleep patterns as a key indicator of readiness.<sup>34</sup> In addition to the responsibilities set forth in DOD Instruction 1010.10, *Standards for Internal Control in the Federal Government* call for agency management to establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives.<sup>35</sup>

However, we found DOD has not assessed DOD's oversight structure for fatigue-related efforts to identify an office or an individual with sufficient authority, sufficient staffing and resources, and committed leadership to oversee the implementation of DOD Instruction 1010.10 and other DOD-wide fatigue-related efforts, and does not have plans to do so. DOD and service officials acknowledged the need to assess the department's approach to overseeing and managing fatigue-related efforts and ultimately determine an institutional owner of fatigue-related issues and programmatic solutions. Further, we found the services have not assigned leadership for implementing DOD Instruction 1010.10. Officials from the Office of the Under Secretary of Defense for Personnel and Readiness told us that without clear service leadership they have had difficulty ensuring implementation of the sleep policy and monitoring the services' efforts.

Without an assessment of DOD's oversight structure for fatigue-related efforts and assignment of DOD and service leadership, these efforts may not be given the necessary authority, staffing and resources, and committed leadership to ensure the department has a culture that views

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<sup>34</sup>DOD Instruction 1010.10.

<sup>35</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 2014).

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## Fragmented Fatigue-Related Research

sleep patterns as a key indicator of readiness and implements efforts across the department to effectively limit service member fatigue.

Based on our analysis of information obtained from the services, we identified nearly 130 fatigue-related research projects the Army, Navy, Marine Corps, and Air Force conducted between 2017 and 2023. These projects were primarily focused on medical or physiological issues; environmental solutions, such as blackout curtains; the use of wearable technology to track sleep data; and the use of scheduling tools, such as software programs, that can model work schedules to account for or identify any risk of fatigue.

Some of the projects we identified were joint efforts between services and between different organizations within a service. For example:

- **Optimizing the Human Weapon System (OHWS):** An Army, Navy, Marine Corps, Air Force, and U.S. Special Operations Command program that analyzes biometric data from wearable devices, such as sleep patterns and heart rate variability. Project officials use this data to flag individuals who may need supporting services and prompt wellness checks from health officials embedded within a unit.
- **Command Readiness, Endurance, and Watchstanding (CREW):** According to officials, while CREW is part of the larger OHWS effort, it is a Navy program that collects biometric sleep, activity, and health data through the use of wearable devices to provide near real-time information to the sailor, to those who manage schedules for sailors standing watch, and to ship leadership. The Navy's Naval Health Research Center—in collaboration with the Naval Surface Force and the Marine Corps, among others—has used this program with 15 afloat commands, enrolling thousands of sailors in the program.

However, we also identified instances of fragmentation among DOD and service fatigue-related research projects.<sup>36</sup> We found multiple organizations within DOD involved in the same broad area researching sleep and fatigue. These organizations are spread across the department, from those at the DOD-level—such as the Defense Health

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<sup>36</sup>Fragmentation refers to those circumstances in which more than one federal agency or more than one organization within an agency is involved in the same broad area, and opportunities exist to improve those efforts. GAO, *2023 Annual Report: Additional Opportunities to Reduce Fragmentation, Overlap, and Duplication and Achieve Billions in Financial Benefits*, [GAO-23-106089](#) (Washington, D.C.: June 14, 2023).






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Agency—to those at multiple levels within each service, including commands to units. These organizations are also spread across multiple domains, including health and safety.

Officials we spoke with were knowledgeable of large fatigue research projects, such as the Navy's CREW, but many were generally unaware of smaller-scale fatigue research projects and their findings. Officials stated that there is a need for different research focuses given the differences in population and environment, such as studying fatigue associated with service members in Alaska experiencing all daylight in contrast to studying fatigue associated with submariners experiencing a lack of daylight. However, officials also emphasized that such research is occurring independently with little cohesion or information sharing and referenced service stovepipes when discussing fatigue-related research efforts.

Fragmentation is particularly apparent in fatigue-related research using wearable devices. We found multiple organizations within DOD engaged in studying the use of wearable technology to track service member sleep, including device accuracy and reliability; applicability in scheduling; and data transfer, storage, and analysis. We identified 48 projects that used wearable technology to collect sleep data between 2017 and 2023. While most of these projects had different research goals or involved different military occupations and settings, many of these projects used the same type of technology or even the same model (see fig. 5).

**Figure 5: Wearable Device Use Across Military Services for Selected Fatigue-Related Research, 2017–2023, by Brand**

		Army	Navy	Marine Corps	Air Force
 <b>Smart watches</b>	Apple Watch	●			●
	Apple Watch Series 8			●	
	Garmin Fenix 3			●	
	Garmin Fenix 5		●	●	
	Garmin Fenix 6				●
	Garmin Fenix 7	●		●	
	Garmin Tactix Bravo				●
	Fitbit Alta		●		
	Matrix Industries Power Watch 2			●	
	Polar Grit X	●		●	●
	Polar Grit X Pro	●		●	
	Polar Vantage V Titan		●	●	
	Samsung Gear Watch	●			
	Samsung Galaxy Watch	●			
	 <b>Dedicated sleep/activity/health trackers</b>	EarlySense Live		●	●
Fatigue Science Readiband		●	●	●	●
Garmin Vivosmart 3			●	●	
Matrix Industries Perceptive				●	
Philips Actiwatch 2		●	●	●	
Philips Actiwatch Spectrum Plus		●			
ResMed S+			●	●	
SleepScore Max			●	●	
Whoop 4.0					●
 <b>Smart rings</b>	Happy Ring			●	
	Oura Ring Generation 1	●		●	
	Oura Ring Generation 2	●	●	●	
	Oura Ring Generation 3	●	●	●	●
 <b>Headgear</b>	DREEM				●
	DREEM 2		●	●	
	DREEM 3		●	●	
	Teledyne PEAKSLEEP Cap	●			
 <b>Heart monitors</b>	Fitbit Inspire HR		●	●	
	Garmin HRM Chest Strap	●			
	Polar H10	●			●
	Polar Team Pro	●		●	

Source: GAO analysis of Department of Defense information; Macrovector/stock.adobe.com (icons). | GAO-24-105917

Note: We asked the Department of Defense (DOD) and the services to provide a list of fatigue-related research projects between 2017 and 2023. Some of the project descriptions provided included the names of wearable brands and others did not. We reviewed this information along with other related

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service documentation and interviews with officials to determine a list of wearable brands, but this list is not comprehensive of all wearable brands used in DOD and service fatigue-related research between 2017 and 2023. If officials did not specify the wearable model version in documentation provided to us, we did not include the version in the figure. According to Navy officials, some of the wearables are to be evaluated by the Navy in the future as part of a project that has had incremental funding between 2017 and 2023. Since the project has received funding, we included these wearables in the figure. Funding information was not available for every project shown. For the Navy and Marine Corps projects that included funding information, we allocated the wearable to the service that funded the project. While some of the Walter Reed Army Institute of Research projects received funding from the Defense Health Agency Military Operational Medical Research Program, Joint Program Committee-5, we allocated the wearable to the Army. Walter Reed Army Institute of Research officials stated that they could not identify the Oura Ring generation currently in use and that is possible that all three generations are in use. Therefore, we included Oura Ring Generations 1, 2, and 3 in the figure for the Army.

We were able to collect cost information for 29 of the 48 wearables projects we identified in our analysis.<sup>37</sup> For these 29 projects the Army, Navy, Marine Corps, and Air Force spent approximately \$25 million. Moving forward, DOD plans to make significant investments in wearable device programs, with plans to spend hundreds of millions on them over the next four years. In a July 2023 report to Congress, DOD estimated the Defense Health Agency will invest roughly \$337 million over six wearable device-related programs from fiscal years 2021 to 2027.<sup>38</sup>

*Standards for Internal Control in the Federal Government* states that management should perform ongoing monitoring—including evaluations across agency functional areas—as part of the normal course of operations to enable the entity to plan, execute, control, and assess the organization in achieving its objectives.

We found there is fragmentation among the services' fatigue-related research efforts in part because DOD leadership does not monitor these

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<sup>37</sup>We were unable to collect cost information for every project we identified. Furthermore, for any joint projects that we identified, we have only partial costs. Additionally, project costs include more than the cost of the wearable. Project costs generally include all aspects of a project, according to officials from all four services. Further, Walter Reed Army Institute of Research officials said in many of the projects provided by them, particularly lab-based studies, the wearables are only a small part of the overall design and contribute a small amount to the overall cost, as the wearable is used as a check for eligibility in the study, providing objective verification that participants were sleeping as they had reported prior to a lab experiment.

<sup>38</sup>Department of Defense, *Report to the Committee on Armed Services of the House of Representatives, Use of Fitness Wearables to Measure and Promote Readiness*, (Washington, D.C.: July 2023). According to officials, the \$337 million is not aligned solely with fatigue-related research that uses wearables. Other efforts include infection prediction and combat casualty care. Furthermore, according to officials, this funding includes efforts to understand the underpinnings of wearable data transfer, efforts to safeguard data, and privacy protections.

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efforts, such as by creating and maintaining a comprehensive list of fatigue-related research projects. DOD officials were unable to provide us with a list of the department's fatigue-related projects since 2017. Instead, officials referred us to various service organizations to obtain information and compile our own list of any fatigue-related research. DOD officials acknowledged that they lack a comprehensive inventory needed to allow the department to understand and identify projects that are currently in place and reveal redundancies, determine gaps, identify cost saving opportunities, and identify methods to show program impacts. Establishing a comprehensive list of fatigue-related research projects will help ensure visibility, encourage collaboration, and leverage lessons learned from fatigue-related projects, as well as help reduce any fragmentation that may exist, potentially leading to cost savings.

## Collaboration Challenges

DOD has not facilitated collaboration across the numerous key stakeholders involved in DOD's efforts to limit sleep deprivation and manage fatigue across the services. Our analysis of information received from DOD officials indicates that fatigue-related research efforts stretch across multiple domains including health, safety, and readiness, and involve an array of diverse technical disciplines ranging from medical researchers to developers of cutting-edge technology. This research is occurring in various offices and commands across the military departments.

We identified some informal networking across these entities to share fatigue-related research efforts, as well as several working groups broadly focused on human performance and optimization efforts, joint medical initiatives, or suicide prevention. However, according to officials, there is not a working group dedicated to sleep or fatigue that exists to regularly gather these numerous key stakeholders. Officials told us it is often necessary to individually engage senior leadership to compete for resources and attention for new or improved technology, processes, and mitigations to manage fatigue.

We identified challenges in transitioning fatigue-related programs and projects with demonstrated or validated results to full implementation. According to officials, such challenges include difficulty with coordination and scalability, a lack of identified program offices and associated funding, and gathering attention of senior leadership. Officials from several services reported that it is even more difficult for many of the offices conducting fatigue research to solicit resources when they are considered nonmedical. For example:

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- An Army official told us that the Optimizing the Human Weapons System program, discussed above, is unlikely to be scaled to higher echelons due to costs. According to Army documentation, the program has demonstrated an ability to preemptively detect personnel hazards. In one instance, according to a program official, program analysts detected an irregular sleep pattern from the wearable device worn by a soldier deployed to Afghanistan. This analysis prompted a wellness check by health officials embedded in the unit, and the soldier was found to be having suicidal thoughts, allowing Army health personnel to connect the service member with lifesaving resources. An Army official stated that, for this program to be prioritized for funding, it would likely need to capture the interest of those at the highest leadership of DOD, who consider many competing priorities.
  - Officials told us the CREW program, discussed above, and the Optimized Watchbill Logistics (OWL) program show promise for their ability to identify fatigue issues and mitigate risks in real time, but both are limited from further expansion due to a lack of dedicated funding. The OWL program is a schedule management system with fatigue risk predictive features that can use the biometric data collected by CREW wearables to assist with sailor workload planning and operational fatigue management.<sup>39</sup> Officials confirmed that CREW has been assessed with fifteen afloat commands. OWL has been installed on nine ships, and their integrated capability was demonstrated during a summer 2023 training exercise. However, CREW and OWL are pilot programs which currently do not have dedicated long-term funding.
  - The Navy's 2022 Naval Surface Forces, Afloat Safety Climate Assessment Survey found that uncomfortable mattresses onboard Navy ships is the second leading cause of inadequate sleep and fatigue cited by sailors.<sup>40</sup> However, Navy officials told us that this problem does not have a Navy resource sponsor willing to examine it further and fund mattress improvements across the fleet. Moreover, multiple attempts to secure funding through the Defense Health Agency have also been unsuccessful because the Defense Health Agency does not view mattresses as a medical issue, according to Navy officials.

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<sup>39</sup>The Navy expected CREW to reach initial operating capability in late 2023. OWL reached this milestone in 2022. The Navy expects to complete testing of these efforts in 2024.

<sup>40</sup>Commander, *Naval Surface Forces, Afloat Safety Climate Assessment Survey FY22 Insights* (Dec. 15, 2022) (CUI).



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Our work on leading practices to enhance interagency collaboration states that stakeholder participants from relevant agencies should be included in cases in which no single organization has the authority, resources, or skills necessary to address a crosscutting challenge.<sup>41</sup> These stakeholders should include individuals with the authority to make decisions on behalf of involved agencies, and those stakeholders with the diverse perspectives, knowledge, skills, and abilities to improve outcomes.<sup>42</sup>

However, we found that DOD has not established a cross-domain working group dedicated to sharing and communicating fatigue research and related information department-wide. DOD and service officials across our selected military occupations stated they do not participate in fatigue-related working groups, one adding that the department's fatigue-related research efforts and related programs would benefit from a dedicated working group. By establishing a cross-domain working group, the department would be better positioned to collaborate on fatigue-related research projects, engage senior leadership on fatigue mitigations to influence management priorities, and improve coordination for the introduction of new or improved technology to manage fatigue.

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<sup>41</sup>GAO, *Government Performance Management: Leading Practices to Enhance Interagency Collaboration and Address Crosscutting Challenges*, [GAO-23-105520](#) (Washington, D.C.: May 24, 2023).

<sup>42</sup>We have previously reported that DOD leverages working groups comprised of military service and DOD officials to collaborate and share information, engage senior leadership, recommend priority areas for risk mitigation, monitor risk management actions, develop tools and processes to address long-term barriers, and build and monitor implementation plans. See GAO, *Defense Industrial Base: DOD Should Take Actions to Strengthen Its Risk Mitigation Approach*, [GAO-22-104154](#) (Washington, D.C.: July 7, 2022).

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## Prior DOD Fatigue-Related Recommendations Remain Unimplemented

In its 2021 study on sleep deprivation and readiness, DOD made seven recommendations to mitigate fatigue and improve sleep among service members (see fig. 6).<sup>43</sup> While the services are taking some actions to address fatigue as discussed above, DOD officials told us they do not have plans to implement and monitor the recommendations from the study, and officials were not able to provide an updated status on each of the recommendations.<sup>44</sup> Over the course of our review, DOD and service officials, as well as respondents to our survey, reported they would benefit from DOD implementing changes or strategies similar to those recommended in the 2021 DOD study.

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<sup>43</sup>Department of Defense, *Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces* (March 2021). Section 749 of the National Defense Authorization Act for Fiscal Year 2020 required DOD to complete a report that provided 1) a standardized definition of sleep deprivation; 2) an assessment of the prevalence of sleep deprivation; 3) an assessment of whether there may be a relationship between sleep deprivation and medical conditions such as traumatic brain injury, post-traumatic stress disorder, and depression; and 4) recommendations. Pub. L. No. 116-92, § 749 (2019). The DOD study identified seven recommendations and 11 associated strategies to mitigate the risk of sleep deprivation and to improve sleep among service members.

<sup>44</sup>The Suicide Prevention and Response Independent Review Committee also made recommendations related to sleep. For example, it recommended that the department ensure duty schedules allow for 8 hours of sleep and minimize the frequency of shift changes, and that the department provide education in healthy sleep habits during training and unit formations—similar to the 2021 DOD study on sleep deprivation and readiness. An implementation memorandum following the report directed commanders at all levels to promote mission readiness through healthy sleep throughout the department, in accordance with DOD Instruction 1010.10. Officials with sleep-related responsibilities whom we spoke with during this review did not have information on how the department will implement or monitor these sleep-related recommendations from the Suicide Prevention and Response Independent Review Committee.

**Figure 6: DOD-Identified Recommendations and Related Strategies to Mitigate Fatigue and Improve Sleep among Service Members, 2021 DOD Study on Sleep Deprivation and Readiness**



**Adopt duty schedules to ensure 8 hours of sleep**

- To the extent possible, in non-deployed and training units, duty schedules should afford service members 8 consecutive hours of sleep every 24 hours.
- Duty schedules requiring shift work should implement forward-rotation of changing shifts (day to evening to night) and utilize 8-hour shifts whenever possible.
- Operational and tactical battle plans should account for the impact of sleep deprivation, ensuring 8 hours of sleep every 24 hours, with sufficient opportunities for obtaining extra sleep prior to periods of sleep restriction (i.e., sleep banking) and recovery sleep when operational requirements result in less than 8 hours of sleep every 24 hours.



**Establish unit-level sleep trainer positions**

- Establish an enlisted unit-level sleep trainer to promote strategies to mitigate sleep deprivation throughout the unit and advise command on ensuring that service members receive adequate opportunity for sleep.



**Implement training in sleep leadership**

- Provide leader training in basic officer and non-commissioned officer military professional education courses on sleep leadership and the impact of sleep deprivation on physical performance.
- Provide pre-deployment training for service members and leaders on developing an environment conducive to sufficient sleep.



**Provide education and other resources to decrease caffeine use**

- Provide promotion guidance and an educational campaign for service members on caffeine consumption limits to include identifying products with excessive caffeine content.



**Adopt existing research-based strategies to address travel-related circadian rhythm disruption**

- Use well-established strategies for managing travel-related circadian rhythm disturbance such as those developed by elite athletes.



**Expand use of brief behavioral interventions and mobile applications for sleep disruption**

- Expand adoption and training of brief behavioral interventions to address sleep problems in primary and specialty care.
- Promote government-developed mobile application use for sleep management, including ensuring service members have an opportunity to download these mobile applications onto personal mobile devices prior to completion of basic training.



**Establish a clearinghouse for military sleep-related resources**

- Establish a clearinghouse repository for sleep resources to ensure dissemination and availability to front-line military leadership.

Source: GAO analysis of Department of Defense (DOD) information. | GAO-24-105917

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### Reflections from Survey Respondents on Scheduling

"The constant change in my shift work schedule makes it difficult to get adequate sleep, this is in spite of my unit having good sleep policies in theory."  
– *Army helicopter pilot*

"Routinely scheduled for brief times for flights that begin at 0730 followed by a brief time of 1730 for a night flight in the same week without adequate time to adjust my sleep cycle. These brief times mean that sometimes I am waking up at 0630 to make the brief while the same week there are days I won't leave work until 0230. Because I technically work days with the occasional night flight, I am then expected to switch back to the day schedule. This leads to copious amounts of caffeine to stay awake and function during work followed by difficulty sleeping and readjusting to an early morning schedule."  
– *Marine Corps helicopter pilot*

"I am currently on alert and have pulled 3 night shifts. Immediately after I pull a 8-12 hour night shift, I continue to assist with mission requirements until the late afternoon, which takes me off the night shift schedule and interrupts my sleep. This requires me to continue to do my job while sleep deprived."  
– *Air Force missileer*

"During the course of [work travel], we regularly either fail to schedule any days off, or the days off templated on the schedule ALWAYS turn into work days. After several weeks, this causes a significant amount of fatigue and is dangerous when flying."  
– *Army helicopter pilot*

Source: GAO survey, selected written responses. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

**DOD recommendation: Adopt duty schedules to ensure 8 hours of sleep.** DOD stated in its study that due to the sustained high tempo of operations during the past 2 decades, daily duty requirements have taken priority over service members obtaining enough sleep to perform at optimal levels. The report stated that a commitment to promote and encourage service members to obtain adequate sleep is a vital tool to mitigate associated operational and readiness risks.

Similarly, over the course of our review, officials told us they believe a policy change that prioritizes sleep, such as adopting schedules to ensure 8 hours of sleep, would help change the DOD culture to value sleep rather than view sleep deprivation as part of being in the military and sleep as something for the weak. For example, one missileer we spoke with told us that he regularly remained awake for the duration of his 24-to-36-hour shift to ensure he was doing his job the best. This statement is in direct contradiction with research findings and trainings from the services, which state that lack of sleep affects the brain the same way as being drunk and routinely getting 5 to 6 hours of sleep per night is like performing with a blood alcohol level of 0.08 percent, which is like being drunk on duty.

The services have publications that recognize the need for cultural change related to sleep. For example, Navy and Marine Corps doctrine from 2010 states that leaders must attack existing military cultural norms that place a high value on the apparent ability to function without sleep.<sup>45</sup> A 2020 Army program document notes that engaged leaders must set a personal example and foster an environment conducive to changing the culture of health and fitness in the Army.

In written comments to our survey, some respondents stated duty schedules that ensured sufficient sleep would be beneficial and noted that long duty days prevent them from obtaining enough sleep.<sup>46</sup> For example, one respondent stated there is not enough time in the day to do everything required and to fit in a proper sleep cycle. Another responded that the amount of administrative requirements outside of primary duties

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<sup>45</sup>Marine Corps Reference Publication 6-11C and Navy Tactics, Techniques, and Procedures 1-15M, *Combat and Operational Stress Control* (Dec. 20, 2010).

<sup>46</sup>Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

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placed on the average Marine make it unrealistic to be able to truly manage a work life balance and consistently get a good night of sleep.

**DOD recommendation: Establish unit-level sleep trainer positions.** DOD stated in its study that unit-level sleep trainers would facilitate sleep plans, monitor individual sleep performance, and train members of their units on behavioral strategies for minimizing and mitigating sleep deprivation. These sleep trainers would promote the use of strategies to mitigate sleep deprivation throughout units and advise commands on ensuring that service members receive adequate opportunity for sleep.

**Reflections from Survey Respondents on Sleep Trainers**

"Having a sleep trainer or sleep education program should be a thing for missile squadrons. We've recently had people fall asleep at the console in the capsule, and others being sleep deprived out in the field because they don't manage their sleep shifts effectively. I think having some kind of education or a sleep planner/trainer would be beneficial, so people aren't stressed out about pushing past their limits and staying up during their shift and planning better about getting sleep."

– *Air Force missileer*

Source: GAO survey, selected written responses. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

Army officials told us that the Army includes sleep education and training as part of its Holistic Health and Fitness system, which focuses on five readiness domains, including physical, mental, spiritual, nutritional, and sleep. The program embeds Holistic Health and Fitness performance teams in brigades, including specialists in sleep, nutrition, physical therapy, athletic training, strength, and cognitive performance. According to Army officials, the effort began with 28 brigades in fiscal year 2021 and will add 10-15 brigades every subsequent year totaling 110 Holistic Health and Fitness brigades by fiscal year 2029.

Very few of our survey respondents were familiar with sleep trainers. Nearly 85 percent of our survey respondents (160 of 190) said that their unit does not have a sleep trainer. If they did, unit-level sleep trainers could advise the command about changes that might help service members obtain more sleep. For example, in written comments to the survey, a survey respondent stated that additional duties and mandatory attendance at presentations that take place during resting hours (i.e., off shift) lead to fatigue. A unit-level sleep trainer could communicate this to the command, which could lead to changing the times for the mandatory presentations to allow for more sleep.

**DOD recommendation: Implement training in sleep leadership.** DOD stated in its study that the first step toward reducing and mitigating the impact of sleep deprivation in the military should be commanders at all levels committing to sleep leadership. DOD added that sleep leadership should be emphasized as a core competency in readiness, with consideration given to evaluating leaders based on whether the service members in their stewardship receive sufficient sleep hours per night.

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### Reflections from Survey Respondents on Sleep Leadership

"Good leadership and management will limit/manage sleep deprivation. Bad leadership will overtax your aircrew and lead to a mishap."

– *Marine Corps helicopter pilot*

"In my training as a helicopter pilot, sleep deprivation is well advertised. It is readily apparent that a lack of sleep degrades performance. When aircrew advertise they are reaching a limit, does the command acknowledge that and talk about what can be done? Or does it simply say get it done anyways. In my opinion, if aircrew are constantly sleep deprived, the first question should be how in touch is the command with its aircrew and what is leadership asking them to do."

– *Marine Corps helicopter pilot*

"Leadership needs to continue to empower their people to drive for adequate sleep cycles and educating them on how to achieve this."

– *Air Force remote pilot*

Source: GAO survey, selected written responses. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

Similarly, over the course of our review, officials also told us that training in sleep leadership is beneficial. For example, officials from the Walter Reed Army Institute of Research told us the Army will need to train leaders to disseminate sleep-related information to their units to get any real change on how soldiers view sleep. The officials told us they have provided information on sleep leadership that was included in a module for leadership training, and Army training officials told us the information has been beneficial. Navy officials stated similarly that sailors often do not know they are sleeping poorly and do not know how to improve their sleep hygiene. To help sailors, the Commanders of the Naval Surface Forces, U.S. Pacific Fleet and Atlantic issued a force-wide fatigue and crew endurance management policy and followed it up with training that was incorporated into curricula for the Navy Leadership Education Course and Naval Education and Training Command.<sup>47</sup>

One-third of survey respondents reported that their leadership makes a sleep a priority only to a slight extent or not at all (59 of 190), and several respondents stated that improved sleep leadership would positively affect them.

**DOD recommendation: Provide education and other resources to decrease caffeine use.** DOD stated in its study that although potential short-term benefits exist when using caffeine as a countermeasure for the effects of total and partial sleep deprivation, it cannot replace the need for sleep. The report also stated that overuse of caffeine may increase levels of sleep deprivation.

Similarly, over the course of our review, officials told us that most service members use caffeine to overcome fatigue, but noted that it has limitations, particularly when used regularly. In addition, DOD researchers have been calling for service member education on proper caffeine use, including information on the safe amounts of caffeine and consumption timelines. For example, the Consortium for Health and Military Performance at the Uniformed Services University of the Health Sciences reported that research suggests caffeine is relatively safe when used appropriately, but service members need clear guidance on how to best use caffeine during training, missions, and in everyday activities to maintain optimal performance.

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<sup>47</sup>Commander, Naval Surface Force, U.S. Pacific Fleet and Commander, Naval Surface Force Atlantic Instruction 3120.2A, *Comprehensive Crew Endurance Management Policy* (Dec. 11, 2020).

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### Reflections from Survey Respondents on Sleep Education

"Include a sleep education block in [initial training and continuing education] courses or conducting a sleep study for maintainers."

– *Air Force aircraft maintainer*

"Provide education on the importance of sleep and strategies to have more restful sleep."

– *Maine Corps aircraft maintainer*

"Continued education about the benefits of sleep in a more "preventative medicine" mindset."

– *Air Force fighter pilot*

Source: GAO survey, selected written responses. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

Our survey found nearly 92 percent of respondents (173 of 189) said they used allowable stimulants, such as caffeine, to address or reduce the effects of sleep deprivation, and of those respondents nearly 80 percent (139 of 173) said doing so was beneficial. In written comments to the survey, a respondent stated he is worried about the caffeine dependency exhibited by most service members, and they would benefit from education on the best ways to use caffeine.

**DOD recommendation: Adopt existing research-based strategies to address travel-related circadian rhythm disruption.** DOD stated in its study that research literature includes specific, well-established techniques to mitigate effects of travel-related circadian rhythm disturbances, and it noted that units deploying across six or more time zones should allow at least 2 weeks of adaptation time.

DOD researchers told us they have been working on developing countermeasures to prevent and reverse travel-related circadian rhythm disruption to maximize human performance, and researchers from the Walter Reed Army Institute of Research have developed infographics for service members with strategies for minimizing fatigue when traveling across multiple time zones.

Service members in our review noted that significant travel across multiple time zones has affected their ability to get enough sleep during the work week and sometimes leads to working multiple shifts in 1 day. In fact, one service member told us that after crossing multiple time zones on an international trip, he reported to his duty station to begin a shift 3 hours after arriving in country, with no time to rest or gain adequate sleep.

**DOD recommendation: Expand use of brief behavioral interventions and mobile applications for sleep disruption.** DOD stated in its study that addressing sleep-related issues in primary care settings through behavioral interventions may restore a regular sleep cycle for service members who are experiencing chronic partial sleep deprivation. Doing so may also prevent the onset of depression or anxiety symptoms among service members who may hesitate to seek mental health treatment. The report also stated that military leaders should actively promote existing sleep management mobile applications developed by DOD and the Department of Veterans Affairs and suggested service members should

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not leave basic training without the applications installed on their smartphones.<sup>48</sup>

Over the course of our review, officials told us they are using the smartphone application 2B-Alert, which facilitates fatigue management in operational environments. The application uses established sleep/wake patterns to predict caffeine effectiveness, tactical nap effectiveness, and performance. They believe this application will be beneficial in reducing fatigue among service members. Mobile applications are oftentimes used in conjunction with wearable devices, and DOD officials told us there are many research efforts across the department looking at wearable devices, as discussed above.

Our survey found 55 percent of respondents (89 of 163) whose units did not collect sleep data said that unit collection of sleep data would be beneficial. In written comments to the survey, a respondent stated it would be helpful to have sleep trackers (i.e., wearable devices). The respondent also stated that it would be beneficial to make access to behavioral health and sleep study health easier, faster, and less impactful to careers.

**DOD recommendation: Establish a clearinghouse for military sleep-related resources.** DOD stated in its study that a clearinghouse for military sleep-related resources should be established, disseminated, and available to front-line military leadership.

Over the course of our review, officials told us that fatigue researchers in DOD are a small group, and although formal coordination is limited, there is informal interaction to share fatigue resources and related information which is helpful. For example, in February 2020 the Office of Naval Research hosted a meeting talking about sleep science, which fostered collaboration across DOD. According to officials, it was evident that there was a need to consolidate information into one place to improve communication and collaboration. The recommended clearinghouse could help facilitate this collaboration on sleep-related resources and

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<sup>48</sup>Mobile applications can be used for sleep management to help track sleep or promote relaxation. The DOD report specifically mentions the following mobile applications: Breath2Relax, Tactical Breathe, Military Meditation Coach, CTJ-I Coach, DreamEZ, and 2B-Alert.



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training. We have also previously reported that sharing information and best practices is beneficial to sustaining military readiness.<sup>49</sup>

Despite broad agreement among key officials and service members on the efficacy of DOD's fatigue-related recommendations to limit sleep deprivation and manage fatigue and the services taking related efforts, DOD officials stated that DOD has no plans to begin implementing the recommendations. *Standards for Internal Control in the Federal Government* state that management should complete and document corrective actions to remediate internal control deficiencies, including those resulting from audit findings, on a timely basis. The remediation process is completed only after action has been taken that 1) corrects identified deficiencies, 2) produces improvements, or (3) demonstrates the findings and recommendations do not warrant management action.

We found that DOD has not established time frames for conducting follow-on actions, coordinated with all stakeholders, or identified key officials responsible for implementing the study's recommendations. Alternatively, DOD has not explained why implementing each of the study's recommendations is not appropriate. Without implementing the recommendations or explaining why doing so is not appropriate, the department will miss opportunities to make meaningful changes to the department's culture around sleep.

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## Conclusions

Fatigue and sleep deprivation among active-duty service members continues to be more the rule than the exception. Impairment from fatigue can be equivalent to the effects of alcohol intoxication and increases the risk of collisions and mishaps.

Minimizing sleep deprivation and reducing fatigue for service members is a significant undertaking that will involve structural and cultural changes across the department. DOD and the military services have taken a number of steps to address fatigue across the department, including setting sleep and rest requirements and guidelines, conducting research, and developing mitigation strategies. However, DOD has not assessed DOD's oversight structure for fatigue-related efforts to identify an office or an individual with sufficient authority, sufficient staffing and resources, and committed leadership to oversee the implementation of DOD's overarching sleep-related guidance, and the services have not assigned

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<sup>49</sup>GAO, *Military Depots: DOD Can Benefit from Further Sharing of Best Practices and Lessons Learned*, [GAO-20-116](#) (Washington, D.C.: Jan. 30, 2020).

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leadership to oversee service-level efforts. Without an assessment of DOD's oversight structure and assigning DOD and service-level leadership, DOD cannot guarantee accountability for the numerous efforts spanning the department.

In addition, we identified fragmentation in fatigue-related research projects being conducted across the department, and DOD has not facilitated collaboration across the numerous key stakeholders involved in these and other efforts. Establishing a comprehensive list of fatigue-related research will help DOD gain visibility and reduce any fragmentation that may exist, potentially leading to cost savings. Furthermore, establishing a cross-domain working group to share information across stakeholders would improve coordination for introducing and improving fatigue mitigation strategies.

In 2021, DOD conducted a study on sleep deprivation and made seven recommendations to mitigate fatigue and improve sleep among service members. A variety of DOD officials told us the department would benefit from the mitigation strategies outlined in the recommendations, and service members that responded to our survey agreed. However, while the services have some related efforts, DOD has not addressed these recommendations, either by implementing them or documenting why it would not be appropriate to implement them. By not establishing time frames for and responding to these recommendations or explaining why doing so is not appropriate, DOD will miss opportunities to make meaningful changes to the department's culture around sleep.

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## Recommendations for Executive Action

We are making a total of nine recommendations, including five to DOD, two to the Navy, and one each to the Army and Air Force.

The Secretary of Defense should ensure the Under Secretary of Defense for Personnel and Readiness conducts an assessment of DOD's oversight structure for fatigue-related efforts. This assessment should identify and delegate authority to an office with sufficient authority, sufficient staffing and resources, and committed leadership to act as a focal point for and oversee all DOD-wide fatigue-related efforts. (Recommendation 1)

The Secretary of the Air Force should assign leadership responsible for DOD component head responsibilities related to fatigue listed in DOD Instruction 1010.10. (Recommendation 2)

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The Secretary of the Army should assign leadership responsible for DOD component head responsibilities related to fatigue listed in DOD Instruction 1010.10. (Recommendation 3)

The Secretary of the Navy should assign Navy leadership responsible for DOD component head responsibilities related to fatigue listed in DOD Instruction 1010.10. (Recommendation 4)

The Secretary of the Navy should assign Marine Corps leadership responsible for DOD component head responsibilities related to fatigue listed in DOD Instruction 1010.10. (Recommendation 5)

The Secretary of Defense should ensure the office identified above to oversee DOD-wide fatigue-related efforts creates and maintains a comprehensive list of all fatigue-related research projects. (Recommendation 6)

The Secretary of Defense should ensure the office identified above to oversee DOD-wide fatigue-related efforts uses the comprehensive list of all fatigue-related research projects to compare fatigue-related research to reduce fragmentation among the initiatives. (Recommendation 7)

The Secretary of Defense should ensure the office identified above to oversee DOD-wide fatigue-related efforts establishes a cross-domain working group dedicated to sharing and communicating fatigue research and related information department-wide. (Recommendation 8)

The Secretary of Defense should ensure the Under Secretary of Defense for Personnel and Readiness (1) establishes well-defined time frames for conducting follow-on actions, coordinating with all stakeholders, and identifying key officials responsible for implementing the recommendations of the 2021 DOD study on sleep deprivation and readiness; or (2) documents the reasons that implementing the study's recommendations is not appropriate. (Recommendation 9)

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## Agency Comments

We provided a draft of this report to DOD for review and comment. According to a senior DOD official, the department generally concurred with our recommendations, but DOD did not provide written comments on our report. The department also provided technical comments which we incorporated as appropriate.

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We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, the Secretaries of the Army, Navy,

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and Air Force, and the Commandant of the Marine Corps. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff has any questions about this report, please contact Diana Maurer at (202) 512-9627 or [maurerd@gao.gov](mailto:maurerd@gao.gov). Contact points for our Office of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff that made key contributions to this report are listed in appendix IV.

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

Diana Maurer  
Director, Defense Capabilities and Management

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# Appendix I: Objectives, Scope, and Methodology

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House Report 117-118, which accompanied a bill for the National Defense Authorization Act for Fiscal Year 2022, includes a provision for us to undertake a comprehensive review of Department of Defense (DOD) efforts to limit sleep deprivation and manage fatigue across the military services.<sup>1</sup> This report assesses the extent to which (1) service members are getting adequate sleep, (2) DOD has addressed and managed service member fatigue, and (3) DOD has implemented fatigue-related recommendations from its 2021 study on sleep deprivation and readiness.

To conduct the work for our reporting objectives, we selected several military occupations across the services with a high potential to be affected by fatigue: fixed- and rotary-wing pilots; remotely piloted aircraft pilots; aviation maintenance personnel; motor vehicle operators; and on-alert operations, such as nuclear missileers and watch floor officers.<sup>2</sup> To identify these occupations, we conducted analysis of relevant research, studies, and related articles on sleep deprivation induced fatigue—military specific and general populations—and interviewed cognizant officials at the Office of the Secretary of Defense, Army, Navy, Marine Corps, and Air Force. Based on this analysis and discussions with the Office of the Secretary of Defense and service officials, we identified a variety of characteristics and occupations that may contribute to fatigue, including extended shifts, night operations, high noise environments, operating heavy equipment, and high operational tempo.

We surveyed or met with service members from the four services in these occupations to gain insight into their sleep habits, factors that contribute to fatigue, and mitigations to manage fatigue. First, we conducted a web-based survey for a stratified random sample of service members in those occupations. We analyzed occupational codes for data maintained by the Defense Manpower Data Center, and we validated the occupational codes with service commands. We then obtained service member information from the Defense Manpower Data Center. We selected a stratified random sample of 1,720 service members from the sample frame of 87,326 service members that fell within the scope of the target

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<sup>1</sup>H.R. Rep. No. 117-118, at 183 (2021).

<sup>2</sup>These military occupations were surveyed, except for Army on-alert operations. For this group, we met with Army watch-floor officers. Additionally, our survey's selected occupations originally included Navy fixed-wing fighter and remote pilots. However, due to data discrepancies that we were unable to reconcile with the Navy, we were unable to survey them.

population. We stratified the sample frame using military occupation groups, service, and rank.

We developed and distributed a survey to selected service members within each occupation. We designed the survey questions in collaboration with a survey specialist and incorporated technical feedback from a separate survey specialist. To ensure that the survey questions were clear, comprehensible, and technically correct, we conducted pretests of our draft survey with ten participants from a variety of services and occupations. During each pretest, all of which were conducted by phone, we tested whether (1) the instructions and questions were clear and unambiguous, (2) the terms we used were accurate, and (3) pretest participants could offer a potential solution to any problems identified. We noted any potential problems identified through the pretests and modified the questionnaire based on the feedback received. A full copy of the survey questions is provided in appendix III.

We conducted the survey between July 2023 and September 2023. To maximize our response rate, we sent multiple reminder emails to encourage recipients to complete the survey and worked with the services to correct or identify alternate emails for service members we could not initially contact by email. In total, the combined survey received responses from 245 service members from the 1,720 selected in our sample, for an unweighted response rate of 14.2 percent. We conducted an analysis of survey responses to identify sources of nonresponse bias that could lead to potential misrepresentations in the interpretation of the results. First, we examined the unweighted response rates for subpopulations based on military occupation, service, and rank. Next, we compared the distributions of the population and the in-scope respondents to determine if significant differences existed.

We identified differences in both response rates and distributions for all subpopulations we examined. Officers had a significantly higher response rate, 22.2 percent (190 of 857), and were over-represented when compared to enlisted service members. Because the response rate for enlisted service members was so low, 6.4 percent (55 of 863), we chose to use only responses from officers in summarized results to avoid potential misrepresentations. The summarized results of officers are not generalizable to the population of all officers in the target population. A statistician conducted analyses and another statistician verified the analyses. We calculated the frequency of responses to our closed-ended survey questions and reviewed responses to the open-ended questions to identify common themes. We also selected and included in our report

examples of statements made by survey respondents—both officer and enlisted—to provide illustrative examples of issues service members face regarding sleep and fatigue.

To assess if service members are getting adequate sleep, we reviewed DOD and service guidance related to sleep and rest to determine the DOD- and service-recommended minimum amount of sleep per night and rest requirements and guidelines. We reviewed DOD and service documentation, including health and safety-related surveys and reports, that included findings on the quantity and quality of service member sleep. We identified this documentation via interviews with officials and our review of citations from related reports. We also analyzed responses from our survey to determine the quantity and quality of sleep for our nongeneralizable sample of service members. We also reviewed the 2021 DOD study on sleep deprivation and readiness to gain an understanding of risks of sleep deprivation.<sup>3</sup> Likewise, we interviewed officials to gain an understanding of sleep and rest requirements and the impacts of sleep deprivation.

To determine the extent to which DOD has addressed and managed service member fatigue, we reviewed DOD and service documentation on organizations involved in fatigue management, fatigue-related research projects, and mitigation strategies to limit fatigue. We also reviewed and analyzed written responses provided by DOD, service, and command officials on fatigue management, including data collection and mitigation strategies. We compiled a list of DOD and service fatigue-related research projects to gain an understanding of the research purpose, organizations involved in the research, mitigations being tested, and cost. We compared the documentary and testimonial evidence we collected with GAO's *Standards for Internal Control in the Federal Government*.<sup>4</sup> Specifically, significant to this audit is the call for agency management to establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives, and to periodically evaluate the organizational structure. Likewise, significant to this audit is that

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<sup>3</sup>Department of Defense, Report to Congressional Armed Services Committees, *Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces*, (Washington, D.C.: March 2021). DOD conducted this study in response to section 749 of the National Defense Authorization Act for Fiscal Year 2020. Pub. L. No. 116-92, § 749 (2019).

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

management should perform ongoing monitoring as part of the normal course of operations and establish the organizational structure necessary to enable the entity to plan, execute, control, and assess the organization in achieving its objectives.

To determine the extent to which DOD has implemented sleep-related recommendations from its 2021 DOD study on sleep deprivation and readiness, we reviewed the report and the report's 494 citations.<sup>5</sup> We spoke with officials about the report and any plans related to implementation of the report's recommendations. We assessed the documentary and testimonial evidence we collected against DOD and service guidance on sleep and fatigue and compared it with GAO's *Standards for Internal Control in the Federal Government*.<sup>6</sup> Specifically, significant to this audit was the internal control component related to the completion and documentation of corrective actions to remediate deficiencies.

We interviewed knowledgeable officials, and obtained documentation where appropriate, from the following organizations:

- Office of the Under Secretary of Defense for Personnel and Readiness
  - Safety and Occupational Health
  - Force Readiness
- Office of the Assistant Secretary of Defense for Health Affairs
  - Health Services Policy and Oversight
- Defense Health Agency
- Joint Safety Council
- Joint Program Committee-5/Military Operational Medicine Research Program

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<sup>5</sup>Department of Defense, *Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces* (March 2021). Section 749 of the National Defense Authorization Act for Fiscal Year 2020 required DOD to complete a report that provided 1) a standardized definition of sleep deprivation; 2) an assessment of the prevalence of sleep deprivation; 3) an assessment of whether there may be a relationship between sleep deprivation and medical conditions such as traumatic brain injury, post-traumatic stress disorder, and depression; and 4) recommendations. Pub. L. No. 116-92, § 749 (2019).

<sup>6</sup>[GAO-14-704G](#).



- Defense Manpower Data Center
- Army: Headquarters, U.S. Army Medical Command, Walter Reed Army Institute of Research, U.S. Army Combat Readiness Center, U.S. Army Training and Doctrine Command, U.S. Army Combat Capabilities Development Command, Defense Centers for Public Health-Aberdeen, U.S. Army Forces Command, U.S. Army Cyber Command, U.S. Army Intelligence and Security Command
- Air Force: Headquarters, 711th Human Performance Wing, Signature Tracking for Optimized Nutrition and Training Lab, Safety Center, Air Combat Command, Global Strike Command
- Navy: Naval Health Research Center; Naval Postgraduate School, Naval Information Forces, Naval Safety Command, Naval Air Systems Command, Naval Air Force Atlantic Command, U.S. Pacific Fleet
- Marine Corps: Marine Corps Safety Division, Marine Forces Command
- Office of the Senior Enlisted Advisor to the Chairman, Joint Chiefs of Staff
- Office of People Analytics

We conducted this performance audit from March 2022 through March 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix II: Reflections from GAO Survey Respondents

**Figure 7: Survey Responses on Actions the Military Can Take to Limit or Manage Sleep Deprivation**

## What else, if anything, can the military do to limit or manage sleep deprivation?



**Fixed-wing pilots**

“Make doing a sleep study for pilots that are having sleep issues happen faster and without jumping through so many hoops...”  
 “Increase competent manning in understaffed administrative duties to support the warfighter.”  
 “Stop trying to fix the symptoms and fix the cause. The cause of poor sleep quality is because of under-manning coupled with over-tasking...”



**Rotary-wing pilots**

“Stricter adherence to standard duty days. Compliance with the published long range training calendars to provide lower echelons with predictability.”  
 “A peacetime optempo should never outpace a wartime optempo.”  
 “If you expect a unit to pull 24 hour duty 7 days a week there should be facilities that support crew rest. Separate sleeping quarters, beds, blankets, etc.”



**Remote pilots**

“Get rid of useless 24 hour nonsleeping duties and get away from the mindset of sleep when your dead”  
 “A big issue I see with being a night time worker is the rest of the world does not operate as so. All on base medical appointments don't work with shift schedules... it is like a day-walker being told they have to go to the dentist at 3am on Sunday morning. Base services are not offered outside "banker's hours" but shift workers don't operate that schedule so we have to mess up our sleep schedule for just about everything.”  
 “... hire sleep trainers, and physical therapists or weight trainers who can help us build healthier lifestyles.”



**Aviation maintainers**

“Provide education on the importance of sleep and strategies to have more restful sleep”  
 “Get Airmen to training about how important it is to sleep, and why.”  
 “Include a sleep education block in [Basic Military Training] or [Professional Military Education] courses or conducting a sleep study for maintainers.”



**On-alert operations**

“Having a sleep trainer or sleep education program should be a thing for missile squadrons. We've recently had people fall asleep at the console in the capsule, and others being sleep deprived out in the field because they don't manage their sleep shifts effectively. I think having some kind of education or a sleep planner/trainer would be beneficial, so people aren't stressed out about pushing past their limits and staying up during their shift and planning better about getting sleep.”  
 “Make improving environmental factors affecting crew rest a priority when developing new facilities for Missilers, take steps to improve manning in missile squadrons to decrease frequency and length of field deployments, and work on timing mission critical events that require all crew members to be awake so as not to interfere with sleep cycles typically seen in our career field.”

Source: GAO survey responses (selected written comments); photos provided by U.S. Air Force/Staff Sgt. C. Callaway, U.S. Air Force/Senior Airman D. Donaldson, U.S. Air National Guard/Staff Sgt. B. Rizor and U.S. Marine Corps/Cpl. T. W. Stewart. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

**Appendix II: Reflections from GAO Survey Respondents**

**Figure 8: Survey Responses on Additional Thoughts About Sleep Deprivation**

**Is there anything else we should know about sleep deprivation in your position or unit that this survey has not addressed?**



**Fixed-wing pilots**

“Guys will get burned out very quickly and it will severely affect their job performance. If sleep isn't address, it could lead to the next mishap and potentially be a causal factor. “

“WE NEED TO MAKE ACCESS TO behavior health and sleep study health easier, faster, and less impactful to careers. We are humans, we all have issues; lets address and fix them.”



**Rotary-wing pilots**

“When aircrew advertise they are reaching a limit, does the command acknowledge that and talk about what can be done? Or does it simply say get it done anyways. In my opinion, if aircrew are constantly sleep deprived, the first question should be how in touch is the command with its aircrew and what is leadership asking them to do. “

“There are rules and [Standard Operating Procedures] in place that in theory should allow us adequate sleep; however, our unit often ignores those rules or there is perceived pressure to ignore crew rest/crew day if you are not on a flight the following day. This leads to cumulative fatigue.”



**Remote pilots**

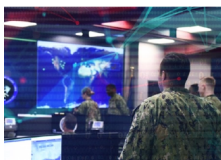
“... a combination of an increase in inexperienced crews who do not yet have good strategies to manage shift work and prolonged sleep deprivation due to shift work for experienced crews creates a dangerous operating environment.”

“Even when I am able to get adequate sleep I am still tired due to an extended period of time in a high op tempo and my body doesn't know how to come down so I can't catch up and there isn't a good strategy to address this.”



**Aviation maintainers**

“... there is not enough time in the day to do everything required to actually be able to fit the amount of time required for a proper sleep cycle... In the end, you receive disgruntled Aircraft Maintainers who worked hard to get qualified only to leave because of being burnt out.”



**On-alert operations**

“The missileer crew force, along with other scheduling issues, is rapidly approaching an all-time low in morale due to a lack of consistency and lack of attention to crew health. The rapidly changing sleep schedules that crew members are expected to maintain are not cohesive with those crew members performing at the highest standards that missileers are required to achieve on a daily basis. Sleep is essential for function and with sleep issues on the rise, function will surely be on a downward trend. “

“Missiliers in their first three years at a missile base go through a tough schedule that affects sleep and often judgement when sleep has been deprived.”



**Motor vehicle operators**

“AR 385-10 states that an operator of a military vehicle will be provided 8 hours of uninterrupted rest in any 24 hour period of operating a military vehicle. This regulation is never enforced and has almost become a running joke in the military because it is never enforced.”

“[Charge of Quarters]/Staff Duty is 24 hours with no sleep. If the Soldier were to drive home after duty they run the risk of falling asleep at the wheel. Units are not being held accountable for basically creating a situation where the service member can be injured and blaming the soldier for not getting sleep when they are not allowed to sleep on duty.”

Source: GAO survey responses (selected written comments); photos provided by U.S. Air Force/Staff Sgt. C. Callaway, U.S. Air Force/Senior Airman D. Donaldson, U.S. Air National Guard/Staff Sgt. B. Rizor U.S. Marine Corps/Cpl. T. W. Stewart and U.S. Navy/O. Wood. | GAO-24-105917

Note: Our analysis includes written responses from a nongeneralizable sample of officers and enlisted service members we surveyed from selected military occupations that have a high likelihood of experiencing fatigue.

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# Appendix III: GAO Survey of Selected Military Occupations

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We administered a web-based survey that included the questions listed below to determine the extent to which service members are getting enough quality sleep, to identify factors interfering with service member sleep, and to learn about implementation of fatigue management policy and guidance. We included a few open-ended survey questions and analyzed the information by completing a content analysis. Although the format has been modified for readability purposes, this appendix accurately replicates the content of the web-based survey questions and response options. Terms used in the survey were defined within the question that first introduced them to the survey. For more information about our methodology for designing and administering the survey, see appendix I.

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## Survey Intro and Screener

The U.S. Government Accountability Office (GAO), which is responsible for reporting to Congress on federal programs, is studying the Department of Defense's efforts to limit sleep deprivation and manage fatigue. GAO is conducting this survey to learn about service member sleep-related fatigue across military occupations. For the purposes of this survey, we will be focusing on fatigue caused by sleep deprivation.

*Standards for Internal Control in the Federal Government* We sent you this survey because you are in an occupation or position that may be affected by sleep deprivation.

**1. You have been selected for this survey because you are a [occupation].**

**2. Have you served in this position within the last 12 months?**

- Yes
- No

*If no, end survey*

**3. This survey will ask questions about your personal sleep habits, sleep rest requirements, leadership and culture, sleep data collection, and strategies to address fatigue.** Your responses will provide valuable information to the Congress about service member fatigue related to sleep deprivation. The results of this survey may help the military limit fatigue caused by sleep deprivation.

Nothing that would identify you will be reported. Your responses will not be attributed to you personally or to any specific unit. We will combine all responses and discuss the information in an aggregate format in our report to Congress.

**4. What is your current rank?**

▼ E-1 (1) ... W-5 (24)

**5. Over the last six months, which of the following best describes your usual work pattern?**

- Day only
- Night only
- Shift work
- Other (please specify)

**6. What type of shift work best describes your usual work pattern over the last six months?**

- Forward-rotating shift (*for example, 0600-1400 for three weeks then 1400-2200 for three weeks, etc.*)
- Backward rotating shift (*for example, 1400-2200 for three weeks, then 0600-1400 for three weeks, etc.*)
- Other (*please specify*)

*Question 6 was displayed only if the answer to question 5 was "Shift work."*

**7. Over the last six months, how many hours of sleep, on average, did you typically get each day during your work week?**

- 3 hours or fewer per 24 hour cycle
- 4-5 hours per 24 hour cycle
- 6-7 hours per 24 hour cycle
- 8 or more hours per 24 hour cycle

**8. Over the last six months, which of the following best describes the quality of your sleep during your work week?**

- Extremely poor
- Moderately poor
- Moderately good
- Extremely good

**9. Over the last six months, how often have the following operational factors affected your ability to get enough sleep during your work week?**

	Never	Rarely	Sometimes	Often	Always	Don't know
High operating tempo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Primary duty requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Additional duty requirements <i>(i.e., collateral duties)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shift work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Limited extreme operations <i>(i.e., 24 - 96 hours continuous operations)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not enough personnel or qualified personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other operational factors <i>(please specify)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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**10. Over the last six months, how often have the following miscellaneous factors affected your ability to get enough sleep during your work week?**

	Never	Rarely	Sometimes	Often	Always	Don't know
Medical reasons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal reasons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other miscellaneous reasons <i>(please specify)</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**11. Are you currently deployed?** *(Please include TDY five days or longer to another country or on sea duty.)*

- Yes
- No

**12. Over the last six months, have you been deployed, or TDY five days or longer to another country, or on sea duty?**

- Yes
- No

*Question 12 was displayed if 11 was answered "No."*

**13. Over the last 6 months, how often have the following environmental factors affected your sleep while you were deployed or TDY to another country or on sea duty?**

	Never	Rarely	Sometimes	Often	Always	Don't know
Temperature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exposure to light	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of daylight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Noise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bedding	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*This question was asked if respondents answered "Yes" to question 11 or question 12.*

**14. To what extent does your unit leadership make sleep a priority?**

- Not at all
- To a slight extent
- To a moderate extent
- To a great extent
- Don't know

**15. Are you aware of policies related to sleep that apply to you or your occupation?**

- Yes
- No

**16. Does your unit have minimum rest requirements for your occupation (i.e., time when you are not required to actively perform tasks, including time provided for uninterrupted sleep)?**

- Yes
- No
- Don't know

**17. How often are the minimum rest requirements enforced in your unit?**

- Never
- Rarely



- Sometimes
- Often
- Always
- Don't know

*Question 17 was displayed if question 16 was answered "Yes."*

**18. In the last 12 months, have you had a briefing or training where sleep was discussed?**

- Yes
- No
- Don't know

**19. Does your unit currently have a sleep trainer (i.e., a person who facilitates sleep plans, monitors individual sleep performance, and trains unit members on behavioral strategies for minimizing and mitigating sleep deprivation)?**

- Yes
- No
- Don't know

**20. Do you report to your unit or command on how many hours you sleep?**

- Yes
- No

**21. How often do you report accurately?**

- Never
- Rarely
- Sometimes
- Often
- Always

*Question 21 was displayed if question 20 was answered "Yes."*

**22. Does your unit collect sleep data?**

- Yes
- No
- Don't know

*A question 22 answer of "Don't know" would skip to question 25.*

**23. Does your unit use the sleep data it collects?**

- Yes
- No
- Don't know

*Question 23 was displayed if question 22 was answered "Yes."*

**24. Do you think it would be beneficial for your unit to collect sleep data?**

- Yes
- No

*Question 24 was displayed if question 22 was answered "No."*

**25. Do you have any of the following concerns regarding your sleep data being collected?**

	Yes, a great concern	Yes, a moderate concern	Yes, a slight concern	Not a concern
Privacy concerns over collection of sleep data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discomfort with wearing a sleep tracking device	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Operational security prohibiting use of data wearables in certain situations (i.e., operational missions, secure facilities, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**26. Have you ever been asked to participate in a military study that incorporated wearables (i.e., Garmin or Polar watches, Fitbits, Oura rings, etc.) to track your sleep habits? (Note, a study could include a survey, a report, a pilot, or an initiative)**

- Yes
- No

*If "No," skip to question 29.*

**27. What was the study?**

**28. How was the sleep data that was collected on you used?**

**29. Have you ever experienced sleep deprivation during your work week that has affected your work?**

- Yes
- No

*If question 29 answer is "No," skip to question 32.*

**30. Over the past six months, how often has sleep deprivation affected your work?**

- Never
- Rarely
- Sometimes
- Often
- Always
- Don't know

**31. Please provide an example(s) of how sleep deprivation has affected your work:**

**32. In thinking about your unit, how satisfied or dissatisfied are you with the following aspects of your work environment?**

	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Very satisfied	Don't know
Unit leadership attitude towards sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Training and education on sleep	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rest or sleep opportunities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**33. Over the last six months, have you used any of the following strategies during your work week to address or reduce the effects of sleep deprivation?**

*Please answer "Yes" only if you used the strategy more than once over the entire six-month period.*

	Yes	No
Environmental solutions ( <i>i.e., black-out curtains, mattresses, chill pads</i> )	<input type="radio"/>	<input type="radio"/>
Allowable stimulants ( <i>i.e., coffee, caffeine pills, energy drinks</i> )	<input type="radio"/>	<input type="radio"/>
Medications used to induce, extend, or improve the quality of sleep, and to reduce wakefulness during sleep	<input type="radio"/>	<input type="radio"/>
Wearable technology ( <i>i.e., Garmin or Polar watches, Fitbits, Oura rings, etc.</i> )	<input type="radio"/>	<input type="radio"/>
Tactical napping ( <i>i.e., a strategy used nap when long blocks of sleep are impractical</i> )	<input type="radio"/>	<input type="radio"/>
Sleep banking ( <i>i.e., a strategy that extends sleep periods to "bank" extra energy, stamina, and focus</i> )	<input type="radio"/>	<input type="radio"/>
Training and education ( <i>i.e., training and education on impact of sleep deprivation, or strategies to achieve quality sleep</i> )	<input type="radio"/>	<input type="radio"/>

**34. For each of the strategies you used, was the strategy beneficial in addressing or reducing the effects of sleep deprivation? (Yes/No)**

*Only the options the respondent answered "Yes" to in question 33 would appear here.*

**35. For each of the strategies you did NOT use, do you think the strategy would be beneficial in addressing or reducing the effects of sleep deprivation? (Yes/No)** *Only the options the respondent answered "No" to in question 33 would appear here.*

**36. What else, if anything, can the military do to limit or manage sleep deprivation?**

**37. Is there anything else we should know about sleep deprivation in your position or unit that this survey has not addressed?**

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# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

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

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## Staff Acknowledgments

In addition to the contact listed above, Chris Watson (Assistant Director), Laura Czohara (Analyst-in-Charge), James Ashley, John Bornmann, Alexandra Gonzalez, Samuel Harbaugh, Amie Lesser, Amanda Manning, Cary Russell (retired), Benjamin Sclafani, Michael Silver, Emily Wilson, and Elizabeth Wood made key contributions to this report.

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# Related GAO Products

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

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

*Air Force and Navy Aviation: Actions Needed to Address Persistent Sustainment Risks*, [GAO-22-104533](#). Washington, D.C.: June 15, 2022.

*Military Vehicles: Army and Marine Corps Should Take Additional Actions to Mitigate and Prevent Training Accidents*, [GAO-21-361](#). Washington, D.C.: July 7, 2021.

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

*Unmanned Aerial Systems: Air Force Should Take Additional Steps to Improve Aircrew Staffing and Support*, [GAO-20-320](#). Washington, D.C.: June 25, 2020.

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

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## GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

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