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Management of Sleep and Fatigue in Military Aviation

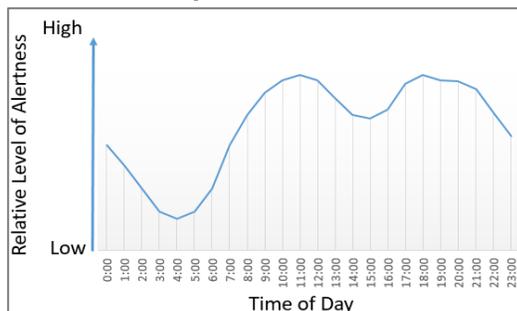
In recent years, Congress has expressed concern over the effects of sleep deprivation on servicemember health and military readiness, as well as its impact on military aviation safety. Aviators in all military services of the Department of Defense (DOD) with high operational demands and austere work settings may experience sleep deprivation and fatigue. To counter these effects, the military services use a variety of mitigation strategies (i.e., non-pharmacological and pharmacological measures) to enhance aviator safety and prevent aviation mishaps. This In Focus provides an overview of those mitigation strategies and offers issues for congressional consideration.

Background

The U.S. Centers for Disease Control and Prevention estimates 32.5% of adults do not meet the Healthy People 2020 (HP2020) criteria for sufficient sleep. In comparison, the 2018 DOD Health Related Behaviors Survey estimated 54.6% of active duty servicemembers did not meet HP2020 criteria. HP2020 categorizes sufficient sleep as at least seven hours in a 24-hour period. Research indicates a variety of detrimental health effects arise from both acute and chronic sleep deprivation.

Sleep deprivation and fatigue are two distinct physiological states. The National Institutes of Health defines *sleep deprivation* as a condition that occurs when someone “[does not] get enough sleep.” Sleep deprivation is a contributor to fatigue. The National Institute for Occupational Safety and Health defines *fatigue* as a “feeling of weariness, tiredness or lack of energy.” Sleep deprivation and fatigue can be most apparent when an individual is awake counter to their circadian rhythm (i.e., during the circadian trough of alertness), typically apparent during the early morning hours (see **Figure 1**).

Figure 1. Relative Level of Alertness and Wakefulness Based on Time of Day



Source: CRS, Derived from Shappell, et al., *Crew Rest and Duty Restrictions for Commercial Space Flight*, available at <https://rosap.ntl.bts.gov/view/dot/34244>

Military aviators may experience sleep deprivation and fatigue due to a variety of factors, including inhospitable

sleep environments, operational demands, unpredictable schedules, long-duty days or flight durations, challenging flight conditions, and circadian-rhythm disruption due to crossing multiple time zones, known as chronodisruption. In a March 2021 report to Congress, DOD stated sleep deprivation has “significant effects on the physical, cognitive, and emotional functioning needed for readiness, occupational, and operational mission fulfillment.” The report also described the “risk of accident in training, operational, and combat environments significantly increases if Service members are sleep deprived.”

Fatigue Management in Military Aviation

Each military service is responsible for implementing its own policies and procedures to mitigate aviator fatigue and sleep deprivation. The military services use varied approaches to mitigate aviator fatigue, including: (1) administrative and behavioral (i.e., non-pharmacological) measures, and (2) the voluntary use of pharmacological measures. Regulations for each service consistently emphasize non-pharmacological measures as the primary means of mitigating fatigue.

Administrative and Behavioral Measures

Administrative and behavioral measures can include limits on the length of an aviator’s duty day, or time spent flying, and standards for rest and time available for sleep. The military services also educate aviators on the impact of sleep loss and the benefits of consistent sleep.

Pharmacological Measures

Historical Use of Pharmacological Measures. The U.S. military historically has approved pharmacological measures for aviators in certain mission contexts. For example, the Air Force and Navy have authorized the use of pharmacological measures for select missions and aircrew during combat operations, at least since the Vietnam War. The operational needs for these measures have been scrutinized and are an area of review. For example, the Air Force suspended the use of stimulants between 1996 and 2001. After considering survey results from pilots flying during Operation Desert Storm and four placebo-controlled studies, the Air Force validated the need and utility of the measures and rescinded the suspension.

Current Use. Longer flight durations, continuous operations, improvements in night-vision technology and the combat advantage of night operations have led to a greater potential for fatigue and operating during a pilot’s circadian trough, increasing the need for pharmacological measures. The military services authorize aviation medicine specialists (i.e., flight surgeons) to prescribe U.S. Food and Drug Administration (FDA)-approved pharmacological agents as a fatigue management measure when administrative and behavioral measures are known or expected to be insufficient. No DOD-wide policy

standardizes the situations or conditions for use of pharmacological measures. Each military service sets its own policies for which aviators may use pharmacological measures and under which conditions. The services are all similar in limiting pharmacological measures to specific operational circumstances, establishing a process by which authorization for use is conducted (e.g., in both medical and command channels), limiting the amounts prescribed and duration of use, and monitoring use by flight surgeons. In all services, use of pharmacological measures by aviators is voluntary. **Figure 2** lists the pharmacological agents used in fatigue management.

Figure 2. Pharmacological Agents Authorized for Fatigue Management in Aviators and Aircrews

Drug Category	Drug Name (Trade Name)	Services Authorizing Use	Comparative Potential for Abuse
Stimulant	<u>Dextroamphetamine</u> (Dexedrine)	All	High*
Stimulant	<u>Modafinil</u> (Provigil)	Air Force	Low

Drug Category	Drug Name (Trade Name)	Services Authorizing Use	Comparative Potential for Dependency
Sedative-Hypnotic	Zolpidem (Ambien)	All	Low**
Sedative-Hypnotic	<u>Tempazepam</u> (Restoril)	All	Moderate
Sedative-Hypnotic	<u>Zaleplon</u> (Sonata)	Air Force, Army	Low

Source: CRS graphic based on DOD’s “Study on Effects of Sleep Deprivation on Readiness of Members of the Armed Forces,” and analysis of FDA drug data at <http://www.accessdata.fda.gov/scripts/cder/daf>.

Notes: *Typically experienced with doses higher than those used by the services. **When used at prescribed doses. All refers to all services in DOD, except the U.S. Space Force. The FDA defines abuse as the intentional, non-therapeutic use of a drug to achieve a desired psychological or physiological effect. Dependence refers to a physical or psychological dependence where individuals experience symptoms of withdrawal or have impaired control over drug use.

Stimulants. Flight surgeons may prescribe stimulants, commonly called *go-pills*, to counter fatigue and improve alertness and performance, but must issue limited quantities, monitor aviators, and collect unused medications. Use of stimulants requires authorization by the prescribing flight surgeon and the medical chain of command and, at a minimum, a colonel/Navy captain/O-6 in the aviation unit’s chain of command. Military services’ policies authorize selected aviators to use dextroamphetamine. The FDA classifies this stimulant as having a “high potential for abuse” and prolonged use “may lead to drug dependence.” Air Force policy also allows the use of the non-amphetamine-based stimulant, modafinil. The FDA recommends observation for “signs of misuse or abuse,” and notes modafinil can produce “psychoactive and euphoric effects...and feelings typical of other [central nervous] stimulants.”

The military services’ policies differ by authorizing which aviators may receive stimulants. For example, a 2003 Army

Aeromedical Policy Letter on *Pre-deployment Rest or Sustained Operations Agents* authorizes prescription stimulants for aviators. However, some communities, like special operations aviators, likely use them more than others. The Air Force delegates authority for stimulant use to its Major Commands. In turn, Air Force Major Commands restrict stimulant prescriptions to fighter, bomber, and certain reconnaissance aircraft pilots.

Sedative-hypnotics. Typically, a flight surgeon may prescribe sedative-hypnotics, commonly called *no-go pills*, for limited periods and with commander approval, to aid in sleep initiation when an operational need exists. Situations might include inhospitable sleep settings, the need to shift sleep schedules, or crossing multiple time zones. In a 2021 report to Congress, DOD cautioned sedative-hypnotics have a “wide range of side effects” that can impact readiness. Some side effects include drowsiness, disinhibition, impaired cognition, learning deficits, and increased risk of vehicle accidents. To mitigate some effects, regulations prohibit aviators from flying for specific periods of time after ingesting, based on drug type. Flight surgeons must monitor aviators’ use of the drugs and level of fatigue.

Federal Aviation Administration (FAA) Management of Fatigue

Similar to the services’ non-pharmacological measures, FAA regulations stipulate a variety of fatigue mitigation regulations for pilots conducting commercial flights. Some measures include maximum duty time, rest requirements, and number of consecutive nights of flying. FAA regulations do not permit the use of stimulants. However, FAA-certified medical examiners may authorize sedative-hypnotics (including some not authorized by DOD) and melatonin supplements for occasional or limited use by civilian pilots.

Questions for Congress

The following lines of inquiry may assist Congress in considering military aviation safety and support congressional oversight of DOD programs and initiatives to prevent sleep deprivation and fatigue.

Impacts to Military Operations and Readiness

- What lessons-learned from non-pharmacological or pharmacological measures in aviation can be applied to other military occupations (e.g., naval vessel crew, medical personnel, special operations)?
- Should the use of pharmacological measures remain voluntary, or be mandatory under certain conditions?
- How do authorized pharmacological measures affect the risk for substance use or abuse among aviators?

Effectiveness of Fatigue Management Strategies

- What scientific consensus exists regarding the effectiveness of current methods to prevent or mitigate fatigue and sleep deprivation in DOD aviators?
- What DOD efforts are in progress to identify novel or emerging fatigue management strategies?
- What impact would arise from creating a DOD-wide policy on fatigue management strategies in aviation?

Christian Bergtholdt, U.S. Air Force Fellow

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