



Considerations for Medically-Fit Rotary-Wing Aircrew in Future Operations: A Summary Report

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Introduction

The U.S. Army's rotary-wing aircraft modernization effort, Future Vertical Lift (FVL), , promises aircraft that exceed the performance parameters of the current fleet with respect to faster speeds, increased maneuverability and precision, and capacity to facilitate longer duration missions. These changes to the aircraft's design and capabilities will also translate into changes to the physical demands placed on aircrew. In order to promote the health and safety of the aviator as well as career longevity, evaluations of current medical fitness standards and the physical demands of design elements are needed. In this report, we summarize recent findings from retrospective epidemiological reviews that identified conditions and diagnoses concurrent to aeromedical dispositions, discuss the human physiology-critical aspects of FVL aircraft as is established, and provide recommendations for preliminary changes to aeromedical standards for FVL aircrew.

Design Elements and Physical Demands

At this point, it is premature to estimate what design elements will be included in the prototype, let alone the mature aircraft design. However, the capability requirements documentation give some insight into possible physical stressors in the FVL environment and therefore implications for aviator health and safety. Specifically, extended duration missions also mean prolonged exposure to potential physical stressors, such as whole body vibration and noise. Vibration has been proven to affect rotary-wing aviators through back and neck pain and musculoskeletal injury (e.g., tissue microtrauma) (O'Connor et al., 2020; Walters et al., 2013). Helicopters are always a noisy environment, therefore potentially increasing hearing damage, and though there may be some mitigation within the aircraft to the potential physical stressors, this cannot be assumed. High speeds and increased maneuverability may also tend towards increased risk of musculoskeletal injury. Continued monitoring of design specifications as they become available will inform future recommendations.

Epidemiological Reviews

Review of U.S. Army aviators' medical records (maintained and managed in the Aeromedical Electronic Resource Office (AERO) (also referred to as the Aeromedical Epidemiological Data Repository [AEDR]) yielded findings relevant to conditions and diagnoses concurrent with aeromedical dispositions (e.g., waivers, permanent suspension) (Curry et al., 2018). This review of a decade's worth of records (2005-2015) identified the most prevalent diagnoses overall, concurrent to waivers, and suspensions. In addition to evaluating the individual diagnoses, a U.S. Army Flight surgeon organized diagnoses into one of 23 system-based categories (e.g., disorder of spinal column/back, metabolic disorder, psychiatric disorder, cardiovascular including hypertension, disorder of blood fats, lung disorder, dermatologic disorder, etc.). The most prevalent diagnosis was unsurprisingly lower back pain (lumbago). However, despite the increase in spinal disorder risk associated with aging, age was not correlated with aeromedical disposition such that young and old pilots were equally likely to be suspended or waived to fly on this diagnostic category.

Another key finding is that psychiatric disorders were the leading concurrent diagnostic category to permanent suspension from flying duties. Specifically, the leading diagnosis is post-traumatic stress disorder, and of the 56.3% of all suspensions concurrent to psychiatric, spinal, or neurological disorders, psychiatric diagnoses occurred at nearly twice the frequency of the next most common. This finding contrasts with previous studies (Van Leusden et al., 1991) that showed cardiovascular disease to be the leading cause of grounding. There is likely a cohort effect contributing to this finding such that the 10 years of cohort data evaluated was nearly entirely defined by major combat operations and conflicts within the War on Terror. Additionally, changes in lifestyle (e.g., reduced number of smokers) may also contribute. With respect to age, older aviators are more likely to have obtained a diagnosis, but younger aviators are more likely to have been grounded concurrent to a psychiatric diagnosis, suggesting that severity may be greater in younger aviators in the dataset. Given the exploratory nature of this epidemiologic review, additional research is needed to understand this finding. Further analyses were conducted to explore use of selective serotonin reuptake inhibitors (SSRIs), a commonly used class of medications to treat mental health disorders (Kelley et al., 2020). Specifically, this review showed that while SSRI use is relatively rare in the population and concurrent suspensions were common, a sizeable number of aviators were able to maintain flying status while being treated. Given the 2004 change in U.S. Army aeromedical policy allowing SSRI use, this outcome is of particular importance in that it supports the role of SSRI treatment in military aviators.

This epidemiologic review also highlighted increasing rates of metabolic disorder diagnoses over the ten-year review period. A parallel review, conducted as part of a report to congressional defense committees (2018), comparing the health of career helicopter pilots and tiltrotor pilots to a suitable control population, yielded a similar finding. This report concluded that there is an apparent excess risk of metabolic syndrome and hyperlipidemia in the helicopter/tiltrotor cohort. A follow-up study was then conducted to further evaluate the authenticity of these findings. This additional review of AEDR medical reports from the years 2016-2018 did not identify a continuation of this trend and thus this apparent increase in risk was likely a spurious finding representing detection bias due to increased screening for these conditions during the study period.

Finally, further review of the ten-year cohort dataset with respect to obstructive sleep apnea (OSA) showed that while prevalence is less common than in the general civilian population, it is common among the cohort studied (Goldie et al., under review). This coincides with a rising rate of obesity in the military, generally suggesting that robust health promotion measures, detailed medical surveillance for symptoms of OSA, and aggressive management of cases and their co-morbid conditions by the aeromedical community remains vital if we are to maintain individual health, maintain careers and operational output, and improve flight safety. Of the cases where OSA co-occurred with a suspension, many also included a concurrent psychiatric diagnosis, which warrants further evaluation.

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Recommendations

Given the status of FVL aircraft design specifications, it would not be rational to suggest significant changes to aeromedical policy at this time. The normal iterative process of examination of the clinical areas and policy should continue. However, as the design specifications take shape, there will be an opportunity to focus the policy generation effort on those elements of pilot performance and health that are judged to be most potentially compromised by FVL flight characteristics, thereby improving the performance as well as the health and safety of aviators.

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