

Long-endurance UAS operations translated to neuroergonomics

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ABSTRACT

Unmanned Aerial Systems (UASs) are now fully automated systems, which generates - as with most automated system- several issues inherent to their use including prolonged sessions, night working, and working environment physically detached from the flight conditions. Most importantly, they are becoming exceedingly capable of operating for extended periods of time, rendering operator mental fatigue into a serious issue as it affects a multitude of cognitive processes that are critical to the safe operation of UASs, including cognitive flexibility, attention and situational awareness (Chappelle et al., 2018, Caid et al., 2016). **Objective:** The main objective of this study, placed within the context of French military UAS operations, is to report on preliminary work conducted in order to determine long-endurance UAS operations' tasks and cognitive functions involved, specifically for the remote pilot. The idea is to gather insight from experts in the field on how time-on-task, and more generally mental fatigue, might impact the remote pilots' cognitive functioning. **Methods:** In this preliminary work, the first step was to perform interviews for us to learn about UAS operations. We performed 3 interviews: one from a former military UAS pilot, and two from high-ranked officers. **Results:** In this study, we will present a general description of potentially problematic cognitive states arising from prolonged operations in the activity of French UAS remote pilots. More precisely, we will present key elements extracted from these interviews regarding the impact of time-on-task on pilot functioning and link these with cognitive functions that might be impacted and that would explain the subjective experience of these experts. As could of course be expected the use of long-endurance UASs implies specific work conditions for the operators, namely shift work and night work for which pilots report that fatigue remains a major issue. Moreover, despite the high degree of automation within a UAS, a pilot's mental workload may be strained when a monotonous and somnolent inducing mission is interrupted by an intense phase of high workload. Cognitive fatigue may result from these rapid and unexpected shifts in workload. Also, rapid and dynamic changing of mission objectives, so-called retask as well as the changing of pilots within a mission, are unique challenges to UAS operations. In both cases maintaining and regaining situational awareness following such an event are particular challenges to pilots. Hence, following this preliminary assessment of experts' reports on UAS pilots' experiences with long-duration missions, one of the main issues that we deemed as critical and that will lead to subsequent experimental work is studying the effect of time-on-task on cognitive flexibility. **Perspectives:** In addition to currently developing a laboratory task resembling UAS pilot operations thanks to the Paparazzi software (Brisset et al., 2006), a fundamental task is also under development to precisely determine the extend to which time-on-task affects cognitive flexibility, and a comprehensive assessment thanks to the neuroergonomics approach is planned later on with the view to enhance piloting experience and increase both safety and performance of UAS operations.