Effect of Fatigue and Type of Training Strategy on UAV Simulator Performance. ***Andre, T.[1], Hunt, J.[1], Crews, A.[1], & Gluck, K.[2]; USAF Academy[1], Air Force Research Laboratory[2].***

Fatigue induced accidents in both the commercial and military aviation communities have brought to light the importance of studying the effects of fatigue on aviators and flight crews. Previous research consistently points to cognitive performance deficits as a result of sleep deprivation. Research by Caldwell and Caldwell (2005) found that people who have been sleep deprived lose 25-30% of their ability to perform mental work with every 24 hour period of sleep loss. The recent increase in unmanned aerial vehicle (UAV) operations has increased the problem of fatigue in the flying community because of the sustained operations tempos and varying shift schedules. Fatigue also appears to impact expert and novice operators differently. The effect of fatigue on novice operators appears to be more pronounced as performance strategies become more random. The issue of sleep deprivation and the potential interaction with novice and expert performance strategies is an especially important research question in developing accurate cognitive models of UAV pilot performance. Our research study at the Air Force Academy examined the issue of fatigue and its interactions with particular training strategies derived from computational cognitive process models developed at the Air Force Research Laboratory's Warfighter Readiness Research Division in Mesa, Arizona. Specifically, we examined sleep profiles of 26 cadets at the U.S. Air Force Academy in conjunction with novice and expert piloting strategies. The study used a between-subjects design with two independent variables. The first independent variable was the amount of sleep that each participant had for the five days before the experiment. The second independent variable was the type of training strategy used to perform the UAV simulator task. Prior to the experiment we asked the participants about their sleep history and then separated them into two equivalent groups based on their responses. One group of participants was given novice piloting strategies to use while performing a basic maneuvering task in a UAV simulator. The novice piloting strategies involved a focus on performance instruments such as altitude, heading, and airspeed. The second group was given expert piloting strategies to use in the same basic maneuvering task. The expert piloting strategies included the same performance instruments as the novice strategy but added more emphasis on control instruments such as bank angle, pitch, and power (RPMs). We examined the differences in flight performance between the novice and expert training strategy groups. Additionally, we determined correlations between sleep patterns and performance. Our results showed significant differences in performance between the two groups with the expert strategy group showing a performance advantage for altitude and airspeed control. The novice strategy group showed a slight performance advantage for heading control. Correlations between amount of sleep and performance levels were small and insignificant. Performance differences for different levels of sleep were insignificant because we didn't have a true control group of "healthy" sleepers at the Air Force Academy. Implications of novice and expert training strategy differences are also discussed.