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Determination of Mental Workload during Operation of Multiple Unmanned Systems

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Many systems are being developed with the intent of fielding the Army's Future Combat Systems (FCS). In an effort to determine the most effective and efficient way to integrate these new systems within the future force, the US Army Research Laboratory, Human Research and Engineering Directorate (ARL-HRED) is developing a workload model of FCS operations. This development is part of the Human Robotics Interaction Army Technology Objective (HRI ATO) in which Soldier workload models of individual systems are being developed with the intent of being integrated into one complex model. This model will enable the investigation of Soldier workload as well as how these Soldiers/systems can more effectively combine their efforts to accomplish a mission.

FCS will rely heavily on unmanned systems to take on such roles as intelligence gatherer, perimeter security, vehicle reconnaissance, reconnaissance and surveillance for initial entry forces, call for fire, battle damage assessment (BDA), etc. The Robotics non-commissioned officer (NCO) duties within FCS include operating multiple unmanned systems. Given the complexity of possible future missions, the operation of multiple unmanned systems will quite often occur simultaneously. The number of unmanned systems a Soldier can effectively operate simultaneously is one area of concern in fielding these systems. Further, the level of autonomy required to concurrently operate multiple systems effectively will need to be determined. One system of interest is the Micro Aerial Vehicle (MAV). In order to investigate the possible effects on performance of simultaneously operating multiple systems, a workload model was developed to examine performance while operating up to three MAVs. Results indicate that the workload for the operation of one MAV was well within the cognitive limits of a nominal soldier. Operation of two unmanned systems showed high levels of visual demand and very high levels of cognitive demand. Effectiveness at this level could be dependent on the level of autonomy and would present high probability of error. Effective operation of more than two unmanned systems at a time result in extremely high workload levels indicating a Soldier's inability to effectively or safely operate those systems regardless of the autonomy of the systems.