

Cognitive engineering and HMI design of a UAV Ground Control Station

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For eight years QinetiQ, on behalf of the UK Ministry of Defence, has examined the system requirements for using Unmanned Aerial Vehicles (UAV) in deep strike missions. The use of UAVs for this type of mission is considered to be of benefit due to the reduction in harm to the human carrying out the mission; however, the remote execution of such a mission is extremely demanding for the operator. If extensive use of UAVs is to become routine, a number of concerns that may influence their effective use need to be addressed. When we consider the human-in-the-loop (HITL), then the control and use of autonomy are integral aspects that need to be displayed to the end user. Also, considering the volume of information with which an operator can be confronted, the level of workload attained through controlling a given number of UCAVs is a critical element in determining the success of a mission. To date, QinetiQ has completed a number of real-time simulation studies that have investigated how the human manages to control a number of unmanned assets through varying levels of autonomy. The technologies developed within this programme have been tested in missions where a single pilot is responsible for controlling multiple UCAVs and his/her own aircraft; however, QinetiQ has also developed a Ground Station for UCAV control that can be integrated into a simulated environment and can interact with the agent software onboard the UCAVs. When we consider the implications for controlling and supervising a number of UCAVs, it is apparent that the need for designing and implementing an efficient Human–Machine Interface (HMI) is critical. This talk outlines the approach QinetiQ has adopted in designing a Ground Control Station (GCS) for UCAV control. The representation of information to the user is discussed in terms of designing a system that displays information in a way that is cognitively compatible with the user's information processing capabilities. The individual displays that comprise the UCAV GCS are discussed, highlighting the important areas for development and future considerations in UCAV control. Additionally, the talk seeks to highlight methods for maintaining optimum operator situation awareness through the visual display of information.