HUMAN-MACHINE INTERACTION CONCEPTS FOR THE UNMANNED COMBAT ARMED ROTORCRAFT

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Abstract
The U.S. Defense Advanced Research Projects Agency (DARPA) and U.S. Army have completed a year-long concept development period and has now begun a nine-month preliminary design phase for the Unmanned Combat Armed Rotorcraft (UCAR) program. UCAR will be an all-weather, highly autonomous and survivable unmanned rotorcraft fully integrated into the Army's objective force combat maneuver force structure. The system will be designed to collaborate with multiple UCARs and other manned and unmanned systems. Unlike other UAVs, the UCAR will not have a dedicated ground station. Instead, the system will integrate into existing command and control platforms, such as the Future Combat Systems command and control vehicle and combat aviation.

The goal of the UCAR program is to demonstrate the technical feasibility, military utility, and operational value for a UCAR system to perform its armed reconnaissance and attack missions effectively and affordably within the emerging Army Future Force system-of-systems architecture. The UCAR system will be capable of autonomous collaboration with manned and unmanned air and ground systems, and will operate at low altitude in close proximity to manned systems, relying on a human controller primarily for tasking and final weapons release authorization.

The UCAR system will consist of UCAR vehicles (rotor-equipped UAVs with vertical takeoff and landing and hover capabilities) and various human controllers (known as UCAR Control Elements or UCEs) who may be located on the ground or in airborne vehicles. We have been examining human-machine interaction concepts for one of the most challenging UCE roles—where the UCE is the not-flying pilot of an airborne attack or scout helicopter, such as the U.S. Army's AH-64 Apache, and in addition to his or her duties in that role, is also managing the behaviors of a team or a team of teams of UCAR vehicles.

The challenge is to make the UCAR vehicles intelligent and reliable enough so that they do not increase the pilot's workload (or diminish his or her situation awareness) beyond levels currently associated with not-flying pilots involved in mission coordination activities with teams of human-manned aircraft. In this presentation, we will discuss our emerging human-machine integration concepts and designs, the associated intelligence and automation levels for the UCAR vehicles, and the overall UCAR concept of operations that the Lockheed team is working toward. We will also report the results of initial workload studies that illustrate the feasibility of our approach.