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Boeing and a team of flight control scientists from academia have demonstrated leading-edge flight control technologies that potentially could dramatically improve the mission effectiveness of advanced unmanned aerial vehicles.

The effort is part of the Software Enabled Control program (SEC) sponsored by the Defense Advanced Research Projects Agency (DARPA), with technical direction from the U.S. Air Force Research Laboratory.

The demonstration flight, on May 26 at Victorville, Calif., involved the DARPA Renegade rotorcraft UAV, modified to include SEC hardware and software. During the flight, the SEC software assumed control of the Renegade to execute autonomous maneuvering algorithms developed by university teams.

"The SEC program provides the control technology necessary to fully exploit the unique features and capabilities of unmanned platforms, and helps them realize their potential for tactical operations," said Dr. John Bay, DARPA Software-Enabled Control program manager.

Developed by Boeing Phantom Works and teams from the University of California ? Berkeley, Georgia Institute of Technology and Massachusetts Institute of Technology, the SEC software is based on a Boeing Open Control Platform (OCP) architecture.

The OCP provides a middleware platform and run-time framework that allows for easy integration with control design tools to enable rapid prototyping and integration of advanced control technologies being developed under the SEC program. These technologies include vision-based autonomous landing, autonomous optimal vehicle routing, neural net-based flight control, aggressive maneuvering and envelope protection.

"The advanced control technologies being designed, developed, integrated and demonstrated on the SEC-Renegade program directly address our customers' needs by introducing autonomous behaviors that support the tactical use of unmanned rotorcraft," said Patrick Stokes, SEC program manager in the Boeing Phantom Works Network-Centric Operations organization. "And to ensure our efforts remain focused on enhancing mission effectiveness of unmanned rotorcraft, we will continue to engage more potential users of these platforms and technologies."

The OCP-based software was demonstrated first during the fixed-wing phase of the SEC program in July 2004, when an F-15E effectively used a fixed-wing UAV as a partner in coordinated combat operations. The recent demonstration with the Renegade UAV represented a critical risk reduction effort in preparation for a more formal SEC-Renegade Capstone flight demonstration in early 2006.

DARPA's Renegade rotorcraft UAV is based on the Boeing Maverick rotorcraft UAV, which serves as the avionics test bed for the A160 Hummingbird. The A160 is an unmanned helicopter that Boeing Phantom Works is developing for DARPA to fly 2,500 nautical miles with endurance in excess of 24 hours and payloads of more than 300 pounds.

"Although significant challenges remain, the SEC-Renegade flight demonstration represented a major step in transitioning advanced autonomy capabilities from DARPA to the Maverick and A160 autonomous rotorcraft platforms," said Dr. James Paunicka, Boeing Phantom Works technical lead on the SEC program.

Boeing Phantom Works is the advanced R&D unit and a catalyst of innovation for the Boeing enterprise. It provides advanced solutions and innovative, breakthrough technologies that reduce cycle time and cost while improving the quality and performance of aerospace products and services.

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