Boeing Completes Successful Autonomous Flight Control Technology Program

Boeing [NYSE: BA] and a team of university scientists have completed a highly successful multi-year research program to develop and demonstrate cutting edge flight control technologies that dramatically enhance the autonomous operations of advanced unmanned aerial vehicles (UAV).

The autonomous flight control technologies were developed under the Software Enabled Control (SEC) program sponsored by the Defense Advanced Research Projects Agency (DARPA) with technical direction from the U.S. Air Force Research Laboratory (AFRL).

During flight demonstrations, the last of which took place on Feb. 23 before U.S. Department of Defense and NASA observers at Victorville, Calif., the SEC software assumed control of a DARPA Renegade rotorcraft UAV and successfully executed a series of advanced maneuvers.

The autonomous maneuvers included flying optimal routes through a field of pop-up and already-known threats; flying low-level, terrain-hugging profiles to avoid detection; and determining safe landing zones by using vision-based algorithms to process landing site imagery and terrain height information.

"Advanced technologies developed under the SEC program provide for a very cost-effective approach to enhancing the tactical effectiveness of unmanned platforms, providing a low-risk mechanism for the rapid integration of advanced autonomous flight control capabilities," said Patrick Stokes, Boeing Phantom Works manager of Contracted R&D Network-Centric Operations programs. "And these autonomous behaviors can be integrated without the need for costly modifications to the vehicle's existing flight software."

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 the Boeing Open Control Platform (OCP) architecture.

The OCP paves the way for rapid prototyping and easy integration of advanced control technologies developed under the SEC program. These technologies include vision-based autonomous landing, autonomous optimal vehicle routing, aggressive maneuvering and flight envelope protection.

The OCP-based software also was demonstrated during earlier phases of the SEC program. These demonstrations involved fixed wing UAVs, including the ScanEagle (developed by Boeing and The Insitu Group) as well as manned and unmanned collaborative exercises in which an F-15E used a fixed-wing UAV as a partner in coordinated combat operation flight scenarios.

The DARPA Renegade rotorcraft UAV is based on the Boeing Maverick rotorcraft UAV, which serves as the avionics test bed for the A160 Hummingbird, an unmanned helicopter that Boeing is developing for DARPA.

"Our efforts on SEC, culminating with the capstone flight demonstration on the Renegade, have allowed our Boeing team to mine the best technology from SEC and support transition to the A160 and Maverick UAVs," said Dr. James Paunicka, Boeing Phantom Works technical lead on the SEC program.

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