University of Colorado at Boulder

AEROSPACE ENGINEERING SCIENCES

Seminar

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Integrating Unmanned Aircraft Systems Safely into the National Airspace System

Unmanned aircraft systems (UAS) such as the Air Force's Global Hawk and Predator are increasingly employed by the military and Department of Homeland Security in roles that require sharing airspace with civilian aircraft. Missions include pilot training, border patrol, highway and agricultural observation, and disaster management. Commercial users of small UAS are finding many applications they would like to operate. Because of the pressure for widespread access for UASs to the national airspace and the risk of collision with passenger aircraft, UAS operators must find a way to integrate with manned aircraft with a very high degree of safety. The key to safe integration of UAS into the national airspace is the development and assessment of "sense and avoid" (SAA) technologies to replace the manned aircraft pilot's ability to "see and avoid" other aircraft.

MIT Lincoln Laboratory is conducting research to address safe and flexible UAS integration with commercial and general aviation aircraft. Research areas include development of sophisticated computer models that simulate millions of encounters between UAS and civilian aircraft to characterize airspace hazards and collision rates. These models can be applied to assess the performance of SAA algorithms designed to maintain separation, "well clear," between UAS and civilian aircraft while observing and adhering to established right-of-way rules. The Laboratory is also conducting groundbreaking research in the area of collision avoidance logic and is pursuing a probabilistic approach to collision avoidance that considers the uncertainty in pilot response to alerts and uncertainty in future states of the threat aircraft. This approach offers the potential to provide increased safety with decreased false alarms over conventional techniques and is a candidate for future Traffic Alert Collision Avoidance Systems (TCAS) and UAS SAA applications.

The Laboratory is also working with the Department of Defense (DoD) and Department of Homeland Security to develop ground-based sense and avoid (GBSAA) and airborne sense and avoid (ABSAA) surveillance architectures to satisfy the Federal Aviation Administration’s (FAA) requirement for replacing the onboard pilot's "see and avoid" function. Under DoD sponsorship, Lincoln Laboratory has deployed a service-oriented architecture GBSAA test bed that will be utilized in operational and simulation-over-live environments to collect data and operator feedback that can then be used to support future certification with the FAA. This seminar will provide a broad overview of the Laboratory's efforts in UAS airspace integration and next-generation aircraft collision avoidance algorithms and will provide an overview of the GBSAA test bed that is under development for the DoD.

Wednesday, April 6, 2016
2:00 pm
Onizuka Conference Room

Biography: **Rodney Cole** has a math and physics background with a B.S. in physics and M.S. in mathematics From Virginia Tech, and a Ph.D. in mathematics from the University of Colorado. He started his career at MIT Lincoln Laboratory in the early 1990's developing windshear detection algorithms and systems for the FAA, continuing on to lead various teams in weather analysis and weather prediction for both FAA and NASA programs. Rod has taken programs from initial concept through field testing to technology transfer to industry. He has also led an algorithm team developing space surveillance algorithms. Over the past several years he has led the Laboratory's UAS airspace integration programs under sponsorship from DoD, DHS, NASA and the FAA. He currently is the Assistant Group Leader of the Surveillance Systems Group in the Homeland Protection and Air Traffic Control Division where he is helping to lead a broad portfolio of programs focused on aviation safety and efficiency.