MIT Industrial Liaison Program Faculty Knowledgebase Report

Aviation Technologies from MIT Lincoln Laboratory

June 1, 2021 10:00 am - 12:15 pm

10:00 AM   Introduction of MIT Lincoln Lab - video time stamp starts at: 2:06

Jennifer Falciglia
Program Manager, Technology Venture's Office
MIT Lincoln Laboratory

10:15 AM   Lincoln Laboratory ATC Mission Area Overview- video time stamp starts at: 10:55

James K. Kuchar
Assistant Head of the Homeland Protection and Air Traffic Control Division
MIT Lincoln Laboratory

MIT Lincoln Laboratory has been supporting technology research and development for the nation's air traffic control system for 50 years. Example contributions include aircraft surveillance systems, collision avoidance and safety assessment technology, unmanned aircraft integration, weather radar enhancements, and decision support systems to improve air traffic flow efficiency and safety. This presentation will provide a brief overview of recent accomplishments and an outline of current technology development programs.

10:35 AM   Small Airport Surveillance Sensor- video time stamp starts at: 35:42

Matthew Edwards
Assistant Group Leader
MIT Lincoln Laboratory

The U.S. National Airspace System (NAS) depends on a robust, redundant surveillance system to ensure safe aircraft separation in the air and on the ground. However, the existing NAS surveillance network prioritizes coverage in areas and at airports with a large number of operations, so there is a surveillance gap at and around smaller airports where aircraft operations converge in a small area, potentially creating a safety hazard. Safety can be enhanced with a surveillance capability at these smaller airports, but existing airport surveillance systems are expensive to procure and maintain. Lincoln Laboratory has been working with the FAA to design and test a smaller, simpler, lower cost radar surveillance system based on phased array radar technology and modern signal processing, called the Small Airport Surveillance Sensor (SASS). This seminar will provide an overview of the SASS system concept, enabling technology, and recent test results.

10:55 AM

Unmanned Aircraft Airspace Integration Technologies - video time stamp starts at: 51:25

Wesley Olson
Leader of the Surveillance Systems Group
MIT Lincoln Laboratory

Integration of Unmanned Aircraft Systems (UAS) into the U.S. National Airspace System (NAS) requires the development, assessment and deployment of a number of technologies to ensure that these new vehicles do not degrade the current high levels of safety and efficiency. Successful airspace integration requires development of technology to enable UAS to detect and avoid conflicts with other aircraft. Lincoln Laboratory has a long history developing and assessing performance of collision avoidance capability for manned aircraft and has extended these activities to detect and avoid technologies for both the FAA and DoD. In 2008, Lincoln developed a new approach to the detect and avoid problem based on Markov Decision Processes and dynamic programming techniques that explicitly consider uncertainties in the current location and future trajectories of nearby aircraft. This approach allows for the selection of avoidance maneuvers that jointly optimize safety and operational suitability. This seminar will provide an overview of this approach and describe development and deployment of the DoD's Ground Based Sense and Avoid (GBSAA) capability as well as the FAA-funded ACAS X program for UAS and Urban Air Mobility (UAM) vehicles.

11:15 AM

ATC Decision Support Technologies - video time stamp starts at: 1:13:26

Tom G. Reynolds
Leader of the Air Traffic Control Systems Group
MIT Lincoln Laboratory

Air Traffic Control (ATC) is responsible for maintaining the safety and efficiency of the air transportation system. This can be especially challenging during adverse weather conditions such as heavy precipitation, reduced visibility or high winds, all of which can significantly reduce the available capacity of different parts of the aviation system. Accurately predicting these impacts in advance can allow them to be mitigated as effectively as possible. This talk will present an overview of advanced ATC decision support technologies developed at MIT Lincoln Laboratory to address these needs. A particular focus will be on the key role of industry and other stakeholders in the development and implementation of these capabilities.

11:35 AM

AI / Machine Learning Advanced Weather Technologies - video time stamp starts at: 1:31:54

Mark Veillette
Senior Technical Staff Member in the Air Traffic Control Systems Group
MIT Lincoln Laboratory

11:55 AM

Development of a Predictive Maintenance Capability Using Aircraft Data - video time stamp starts at: 1:53:17

Chelsea Curran
Technical Staff Member in the Air Traffic Control Systems Group
MIT Lincoln Laboratory

The U. S. Air Mobility Command (AMC) provides global air transportation to the U.S. Department of Defense and other government organizations. Among its mission areas is the support of air refueling operations using tanker aircraft such as the KC-135. However, due to the aging fleet and delays in the introduction of new tanker aircraft, tanker availability is a key challenge for AMC in preserving mission readiness. MIT Lincoln Laboratory is working with AMC to explore the use of artificial intelligence and machine learning capabilities for a variety of applications related to aircraft safety and operational efficiency. Specifically, we are working to develop a predictive maintenance capability for KC-135 aircraft which relies on the fusion of flight data with maintenance records. This talk describes the algorithms that underpin this capability and how users can leverage it to improve overall aircraft readiness levels.