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ASSEMBLY — 38TH SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety – Emerging Issues

UNMANNED AIRCRAFT SYSTEMS INTEGRATION RESEARCH

(Presented by United States)

EXECUTIVE SUMMARY	
The mission of the Federal Aviation Administration's (FAA) Unmanned Aircraft Systems (UAS) Integration Office is to ensure the safe, efficient, and timely integration of UAS into the National Airspace System (NAS). In order to fulfil this mission while maintaining the safety of the NAS, the FAA requires data to support the development of standards, procedures, and regulatory products related to UAS. This paper describes some of the internal research the FAA is conducting to support safe UAS integration, as well as some of the UAS research partnerships the FAA maintains with other agencies.	
Strategic Objectives:	This working paper relates to the Safety Strategic Objective.
Financial implications:	No funding required.

1. INTRODUCTION

1.1 The mission of the Federal Aviation Administration's (FAA) Unmanned Aircraft Systems (UAS) Integration Office is to ensure the safe, efficient, and timely integration of UAS into the United States' National Airspace System (NAS). In order to fulfill this mission while maintaining the safety of the NAS, and on a timeline that is consistent with the *FAA Modernization and Reform Act of 2012*[1], the FAA requires data to support the development of standards, procedures, and regulatory products related to UAS. This paper describes some of the internal research the FAA is conducting to support safe UAS integration, as well as some of the UAS research partnerships the FAA maintains with other government agencies and other entities.

2. DISCUSSION

2.1 UAS exhibit unique operational performance characteristics; they may fly slower and may have the ability to stay airborne for days or weeks at a time. UAS may exhibit longer

[1] http://www.gpo.gov/fdsys/pkg/PLAW-112publ95/pdf/PLAW-112publ95.pdf

communications delays due to their distributed architecture, which could adversely impact Air Traffic Control (ATC). Furthermore, UAS pilots located in a control station physically separated from the aircraft are not subject to the same sensory cues that a manned aircraft pilot might experience while onboard the aircraft, such as vibrations, engine noises, or an out-the-window view of oncoming traffic.

2.2 Research is needed by the FAA to fully understand these inherent differences between manned and unmanned aircraft to ensure that they may fly together safely within the NAS. The FAA has an extensive UAS research program aimed at validating UAS applicability to existing NAS procedures and supporting the development of:

a) standards and processes for the certification of UAS systems, pilots, crewmembers, and supporting UAS technologies;

b) policies, guidance materials, and advisory circulars on utilizing advanced technologies to demonstrate regulatory compliances while operating UAS in the NAS; and

c) procedures and mitigation strategies to ensure safe UAS operations, including handling of contingencies, and safe interactions with all types of traffic in all classes of airspace.

2.3 The FAA's internal research program draws from FAA facilities including the William J. Hughes Technical Center and the Civil Aerospace Medical Institute and leverages the broad expertise and capabilities from within industry and academia to address key challenges across several focal areas. Examples of current and planned FAA research include:

a) identifying sense and avoid certification obstacles associated with replacing a pilot's "see and avoid" functions with technologies and procedures;

b) assessing operational challenges associated with UAS inability to visually comply with clearances and instructions issued by ATC;

c) assessing operational challenges associated with UAS contingency events such as loss of control link, loss of ATC communications, flyaway and flight termination;

d) assessing operational challenges associated with UAS Global Positioning System (GPS) flight trajectories to existing flight planning and navigational guidance requirements in the NAS;

e) identifying appropriate wake turbulence separation standards for UAS;

f) identifying appropriate airport same runway separation standards for UAS;

g) evaluating UAS communications latencies during time-critical phases of flight;

h) conducting human factors assessments of UAS operations to determine requirements for control stations, pilot and crew training, and task allocation between human and automation;

i) development of UAS categories;

j) establishing data collection systems for UAS maintenance, repair and continued operational safety; and

k) develop Environment and Energy (E&E) modeling capabilities and methodologies for conducting E&E quantitative analyses of select UAS operations within the NAS.

2.4 The FAA also maintains several research partnerships with other government agencies. The FAA partners with the Department of Defense (DoD) in support of DoD integration testing. The purpose of these activities is to evaluate DoD UAS integration flight profiles including standardized UAS procedures.

2.5 The FAA partners with the National Aeronautics and Space Administration (NASA) to collaboratively address the challenges associated with UAS integration. The FAA and NASA leverage resources and expertise between the two agencies to execute coordinated research programs that support UAS-NAS integration. The collaboration effort between FAA and NASA develops a body of evidence (such as validated data, algorithms, analysis, and recommendations) to assist key decision makers, establish policies, procedures, standards, and to develop regulations to enable safe UAS integration into the NAS. Key research focal areas include UAS communications, sense and avoid, human-systems integration, and certification.

2.6 The FAA also partners with MITRE in support of safe UAS integration to inform current and future NAS and UAS standards, policy, and operational and technical system solutions. MITRE maintains a dedicated UAS research portfolio, as well as a UAS Special Emphasis Area that reaches across all of its FAA and DoD portfolios to address UAS integration challenges in collaboration with existing domain-focused research programs. Key areas of collaboration include sense/detect and avoid, UAS standards development, NAS cyber security vulnerabilities from introducing UAS, technical and operational challenges for air traffic controllers, and unique UAS operational considerations supporting strategic airspace planning. This work will help to frame the definition of integration as well as infrastructure and architecture requirements that must be addressed for safe UAS operations.

2.7 These research partnerships facilitate the exchange of research plans, conclusions, and recommendations, to ensure that the critical UAS integration challenges facing the United States' aviation community as a whole are collaboratively managed and executed. This approach minimizes unnecessary duplication of research and allows partners access to UAS research capabilities and skillsets beyond agency walls.

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