

NASA Advisory Council Recommendation**Future Airspace Vision****2022-02-10**

Name of Committee: Aeronautics Committee

Chair of Committee: Dr. John-Paul Clarke

Date of Council Public Deliberation: August 10, 2022

Short Title of Recommendation: Future Airspace Vision

Recommendation:

Although the primary role of certification and development of standards is within the Federal Aviation Administration (FAA) purview, the Council recommends, where relevant throughout its research portfolio, that NASA should conduct trade studies that support the certification process and back-up analyses of why certification criteria are recommended the way they are.

Major Reasons for the Recommendation:

The strong collaboration between NASA and the FAA is encouraging. The Council applauds the synergy between the agencies and encourages NASA to continue enhancing the collaboration.

Consequences of No Action on the Recommendation:

The role of “certification of new aeronautical developments” and the certification of aeronautics standards are within the purview of the FAA. However, the collaboration between the FAA and NASA is critical in this process. Failure to address this recommendation risks a unique opportunity to improve the certification process, including the chance to reduce the certification time. In addition, the Department of Defense should also be included in this discussion.

NASA Response:

NASA and the Airspace Operations and Safety Program (AOSP) appreciate the insights offered by the NAC related to certification and continued collaboration between NASA and the FAA towards future airspace operations.

NASA has taken several steps to ensure that its portfolio contains substantive research, development, and testing activities that will support the FAA certification process and criteria. NASA has established the interagency NASA FAA Research Transition Teams (RTTs) to ensure that research and development needed for new technology implementation is identified, conducted, and effectively transitioned to the implementing agency. It provides a structured forum for researchers and implementers to constructively work together on a continual basis. RTTs ensure that planned research results can be fully utilized and will be sufficient to enable implementation. These research results are provided to the FAA in various forms (studies, data bases, etc.) depending on the nature of the research and data. Below are some of the successful examples:

1. NASA's AOSP Program Director, Akbar Sultan, and FAA's Chief Scientist for Architecture and NextGen Development, Steve Bradford, developed a joint plan titled, "Certification Research Plan for Artificial Intelligence Applications" in July 2021. This plan was also submitted to the United States Congress in March 2022 as part of the requirement from the FAA Reauthorization Act of 2018 (SEC. 741).
2. NASA's Unmanned Aircraft Systems Traffic Management project developed requirements for Unmanned Aircraft System Service Supplier (USS). These requirements were developed based on research and field tests. FAA has implemented relevant requirements as part of Low-Altitude Authorization and Notification Capability towards the qualification of third-party USS providers.
3. NASA's mission task elements towards National Campaigns will provide the necessary data to help FAA with the certification of electric vertical take-off and landing aircraft.
4. NASA is building a Model-Based Systems Engineering environment for the Advanced Air Mobility (AAM) project where air, ground, and enabling systems (such as communication, navigation, and surveillance) requirements are defined and documented, along with performance criteria. Upon validation of these requirements, they will be documented as part of a Book of Requirements.
5. NASA's Air Traffic Management – Exploration project is conducting research related to performance and functions for Provider of Services for Urban Air Mobility (PSUs). It is expected that PSUs will need to be certified by the FAA based on their suitability to support UAM operations. Through RTTs, FAA and NASA routinely exchange lessons learned related to the PSU's functions, developments, and its potential role in enabling AAM operations.
6. AOSP and the NASA Aeronautics Research Institute (NARI) worked closely with FAA's NextGen Office and developed a method to analyze letters of agreement (LOAs) across FAA facilities to extract flight constraints using machine learning. The FAA has submitted a working paper to the International Civil Aviation Organization (ICAO) Assembly Meeting in Montreal, September 27 - October 7, 2022. The paper highlights exploratory work between NASA and FAA to use machine learning techniques to extract flight constraints recorded in LOAs. The Secretary General has distributed it to all the panels for information. Application of machine learning and artificial intelligence capabilities to air traffic management is a focal area to achieving airspace operation modernization and enabling more autonomous aircraft operations. This is of interest to ICAO and is also a congressional requirement for FAA and NASA.
7. NASA's System Wide Safety Project has developed draft recommendations for the use of runtime assurance as a way to enable the use of untrusted components in aviation. These are currently being reviewed by the FAA. Subsequently, they will be shared with SAE's G-34 committee focused on artificial intelligence and machine learning (AI/ML).
8. NASA's System Wide Safety Project uses its research to make similar recommendations to committees such as the Commercial Aviation Safety Team, Drone Safety Team, SAE International G-34, SAE S-18, and ASTM International. NASA and the FAA often collaborate towards these standards committees, with NASA's recommendations being used by the larger body when standards and eventually regulatory guidance and regulations are developed.

9. The Commercial Supersonic Technology Project has collaborated with the FAA Office of Environment and Energy (AEE) on vehicle concept and trade studies to help define procedures and limits for national and, with the ICAO Committee on Aviation Environmental Protection (ICAO-CAEP), international standards for supersonic aircraft noise and emissions. NASA's Quesst mission will create community response data needed by FAA AEE and ICAO-CAEP to define limits for a future certification standard for en route supersonic noise over land.

NASA and FAA continue to collaborate on various advanced methods such as AI/ML applications related to airspace operations. To date, AOSP and NARI have supported efforts on natural language processing, machine learning of standard operating procedures, and certification of machine learning approaches using cases such as runway configuration. As AOSP continues to make progress towards AAM and Sky for All research, the automation architecture, system requirements, validated models, certification requirements as needed, and performance criteria will be uncovered through research, development, and testing.

Development and recommendation of certification standards and criteria are primarily the responsibility of the regulatory agencies such as FAA, and various joint government and industry standards bodies [Institute of Electrical and Electronics Engineers, RTCA, ASTM International, International Organization for Standardization, ICAO, etc.]. The criteria can also be informed through recommendations by additional agencies such as the National Transportation Safety Board or Commercial Aviation Safety Team. Through its research, NASA will deliver analysis and data to inform the development and recommendation of certification standards and criteria by the responsible organizations.