NASA SBIR 2021 Phase I Solicitation

A3.02 Increasing Autonomy in the National Airspace System (NAS)

Lead Center: ARC

Participating Center(s): LaRC

Scope Title:

Increasing Autonomy in the National Airspace System (NAS)

Scope Description:

NASA’s future concepts for air transportation (2030 and beyond) will significantly expand the capabilities of airspace and vehicle management and are anticipated to increasingly rely on autonomy and artificial intelligence and machine learning to ensure safe, secure, and equitable operations. Such future concepts propose a seamless, integrated, flexible, and robust set of systems that are anticipated to include traditional as well as nontraditional vehicle types and operations, diverse airspace domains and mission types, and a service-based architecture to provide user services as those demonstrated within NASA's Unmanned Aircraft Systems Traffic Management (UTM) Project, as appropriate. Future concepts will require resilient, cyber-attack-resistant systems to ensure safe and robust operations that maintain expected levels of safety, as well as accommodate changes to environmental and operational conditions.

Human operators currently perform the most significant roles in decision making in the National Airspace System (NAS). The appropriate allocation of functions as humans team with autonomy (and even current automation) is a critical research question as more autonomous systems are introduced. To address these research challenges, this subtopic seeks proposals that will apply novel and innovative techniques, methods, and approaches to developing tools and/or technologies that will enable successful human-autonomy teaming in the future NAS.

This subtopic is focused on the human-autonomy teaming of the airspace operations in the future NAS. Proposals that do not address the human operator interaction with future NAS technologies will be rejected.

Expected TRL or TRL Range at completion of the Project: 1 to 4
Primary Technology Taxonomy:
Level 1: TX 16 Air Traffic Management and Range Tracking Systems
Level 2: TX 16.3 Traffic Management Concepts
Desired Deliverables of Phase I and Phase II:

- Research
- Analysis
- Prototype
- Software
Desired Deliverables Description:

Technologies that can advance safe and efficient growth in global operations [Aeronautics Research Mission Directorate (ARMD) Thrust 1 Goal] as well as developing autonomy applications for aviation (as under ARMD Thrust 6).

Phase I deliverables may take the form of a prototype/proof-of-concept decision support tool, automation and/or service, a proof-of-concept demonstration of the underlying architecture, and/or validation of the approach taken, which shows focus on a particular aspect or use case of the research and development (R&D) challenge being investigated. Phase II deliverables would presumably take the form of higher TRL tools/decision support services that convincingly demonstrate a solution to the proposed R&D challenge.

State of the Art and Critical Gaps:

State of the Art: NASA has been researching advanced air transportation concepts and technologies to improve commercial operations in the NAS. Autonomy is the focus of increased ARMD interest as evidenced in Thrust 6, Assured Autonomy for Aviation Transformation. Airspace Operations and Safety Program (AOSP) research is increasingly applying autonomous technologies and capabilities towards air transportation challenges. These technologies and capabilities may address limited solutions to targeted problems.

Critical Gaps: The growth of data sciences and autonomy/artificial intelligence technologies continue to have great potential to benefit the development of a more autonomous air transportation system. This is needed to accommodate the increasing demand and diversity of air transportation missions and operations. The interpretation and use of data science-based information by human operators and decision makers, continues to be of interest.

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Relevance / Science Traceability:

Airspace Operations and Safety Program (AOSP).

Successful technologies in this subtopic have helped to advance the air traffic management/airspace operations objectives of the Program. The technologies also introduce new autonomy/artificial intelligence/data science methods and approaches to air transportation problems for current and near-future application, and show where such approaches are/are not appropriate to advance airspace operations.

References:

https://www.nasa.gov/aeroresearch/programs/aosp