UAS Integration in the NAS Project and Future Autonomy Research

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Developing the UAS-NAS Project

There is an increasing need to fly UAS in the NAS to perform missions of vital importance to National Security and Defense, Emergency Management, and Science. There is also an emerging need to enable commercial applications such as cargo transport (e.g. FedEx).
UAS-NAS Project Formulation
Key Stakeholders and Influencing Factors

**Project Focus:**
Unencumbered NAS Access for Civil / Commercial UAS

**Groups Working on the Problem**

- NASA Aeronautics Centers
- NASA ARMD
- RTCA SC-228
- OSD SAA SARP
- World Radio-communications Conference
- NAC Aeronautics Committee UAS Subcommittee
- JPDO
- UAS ExCom
- Federal Aviation Administration
- UAS Aviation Rulemaking Committee
- Industry Committee

The NASA UAS-NAS Project is influenced by several key stakeholders within the UAS Community which helped guide it’s formulation.
The FAA is using several domestic forums, in conjunction with several international forums to lay out the pathway for their priorities and investments. If work is conducted outside of the pathway, the FAA may be unwilling to collaborate.
UAS-NAS Project OV-1
UAS-NAS Technical Challenges

**SAA Performance Standards**
- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for sense and avoid (SAA) performance and interoperability.

**C2 Performance Standards**
- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for terrestrial command and control (C2) communication.

**Human Systems Integration**
- Provide research findings to develop and validate human systems integration (HSI) ground control station (GCS) guidelines enabling implementation of the SAA and C2 performance standards.

**Integrated Test and Evaluation**
- Develop a relevant test environment for use in generating research findings to develop and validate HSI Guidelines, SAA and C2 MOPS with test scenarios supporting integration of UAS into the NAS.
NASA’S Vision for Civil Aviation

Where does autonomy fit?

Transforming Aviation
Autonomy enabling a new overall aviation system with vastly greater capabilities such as on-demand transportation

Enabling New Capabilities
Autonomy enabling re-designed or completely new components of the system to improve safety, efficiency and mobility

Infusing Functionality
Autonomy infused into targeted components of the current system for improvements to safety and efficiency, and to expand the constraints and boundaries of the system
Autonomy is implemented in harmony with humans to maximize the benefit of aviation to society.
Autonomy Strategy Framework

**Vision**
Autonomy is implemented in harmony with humans to maximize the benefit of aviation to society

**Needs**

**Technologies & Applications**
Develop archetypal / model autonomy standards, technologies, functions and mission applications to broadly enable innovation

**Architectures, Methods & Metrics**
Develop architectures and meta-design tools that enable the efficient and effective creation of joint human-machine cognitive systems

**Trusted Systems Integration**
Address the challenges associated with trust between humans and autonomous systems

**Real World Testbeds**
Establish relevant testbeds for testing autonomous systems

**Challenges**

**Technical (Research to Enable)**
Issues such as human-machine collaboration, TEV&V, machine reasoning, sensor integration, etc.

**Socio-Policy (Research to Inform)**
Issues such as liability, public acceptance, moral decision-making, transformation of human roles/tasks, etc.