National Aeronautics and Space Administration

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Unmanned Aircraft Systems Integration in the National Airspace System

NASA's Ikhana aircraft could be the first large unmanned aircraft system to fly in the National Airspace System without the requirement of an escort aircraft in 2018 outside of Class A and Special Use Airspace. Above, this image taken from a NASA King Air shows a Honeywell King Air intruding on the Ikhana's airspace during a test flight June 13. New technology flying on Ikhana alerted the pilots to the presence of the intruder and allowed the aircraft to maintain safe separation. (NASA / Carla Thomas)

NASA's Unmanned Aircraft Systems Integration in the National Airspace System, or UAS-NAS project, works on identifying, developing and testing the technologies and procedures that will make it possible for UAS to have routine access to airspace occupied by human-piloted aircraft.

The UAS-NAS project uses modeling, simulations and flight tests to develop and test technologies that provide safe, effective, secure capabilities including detect and avoid (DAA) and command and control (C2).

Teams of NASA researchers have been working with the UAS community since 2011 to address the technical barriers to routine UAS operations.

Data results from UAS-NAS work inform the minimum operational performance standards that the Federal Aviation Administration (FAA) is using for development of technical standards and operational approval guidance.

Four NASA centers support the UAS-NAS project: NASA's Ames Research Center and Armstrong Flight Research Center in California, Langley Research Center in Virginia and Glenn Research Center in Ohio.

The UAS-NAS project is within the Inte-

grated Aviation Systems Research Program, managed by NASA's Aeronautics Research Mission Directorate at NASA Headquarters in Washington, D.C.

UAS milestone

The remotely piloted Ikhana UAS has been the main airborne platform for the DAA flight tests in collaboration with the FAA and industry partners to continue to evolve safe separation and collision avoidance systems. Four flight campaigns have included more than 944 encounters to date.

Now researchers are planning on a major step toward incorporating large UAS into the NAS with an Ikhana demonstration flight. For the first time a UAS will fly in the NAS, outside of Class A and Special Use Airspace, without an escort "chase" aircraft in 2018. Previous UAS flights in the NAS were permitted only with special FAA permission and required an escort aircraft to act as the aircraft's "eyes" to see and avoid other aircraft.

During the flight demonstration planned for early 2018 from Armstrong, Ikhana will be using its own DAA systems integrated onboard the aircraft and its ground control station to maintain safe separation and to avoid other aircraft.

The Ikhana unescorted aircraft flight demonstration objectives are to engage the FAA air traffic and safety organizations and seek approval on an operationally representative route of flight with a safety case that provides an alternative means of complying with see and avoid regulations with Ikhana's DAA system. This demonstration will lay a foundation for future certification and operational approval process for the UAS-NAS project in partnership with industry, academia and other government agencies.

SIERRA-B UAS-NAS research

Following the Ikhana milestone in early 2018, the next UAS-NAS project flight test series is set to start in the fall of 2018 to support development of DAA standards for medium-sized UAS. These flights from Armstrong will evaluate airborne DAA sensors and system modifications that are low-cost, small, lightweight and use less power.

The SIERRA-B unmanned aircraft system developed at NASA's Ames Research Center in California is the main platform for a new flight test series. (NASA)

While NASA's Ikhana aircraft has been used as a key research UAS, the fall flight series will use NASA's Sensor Integrated Environmental Remote Research Aircraft, or SIERRA-B. Originally developed by Ames, the medium-sized UAS meets flight test requirements, including its large nose bay and payload area, which will house the airborne surveillance sensor and other DAA flight test equipment.

A key test team challenge with the SIERRA-B is its smaller size, which makes it more difficult for pilots to see the aircraft at safe distances during air-to-air encounters. The SIERRA-B has a 20-foot wingspan and weighs about 500 pounds compared to the approximately 8,000 pound Ikhana with a 66-foot wingspan. These flight tests will evaluate how DAA standards developed for larger, faster UAS will need to be adapted for smaller and slower aircraft and thus expand NAS access to a larger group of UAS.

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