

# Unmanned Aerial Systems (UAS) and the National Airspace System (NAS)

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White Paper

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## The FAA Background

The Federal Aviation Administration (FAA) was created in 1958 in response to a series of fatal accidents and midair collisions involving commercial aircrafts. The FAA was mandated to develop plans and policies for the use of the navigable airspace to ensure the safety of aircraft and the efficient use of airspace. The prescribed air traffic regulations should cover the flight of aircraft (such as safe altitudes) for navigating, protecting and identifying aircraft; protecting individuals and property on the ground; using the navigable airspace efficiently; and preventing collision between two aircraft, aircraft and land or water vehicles, and aircraft and airborne objects. Since then, the American airspace has become one of the most regulated modes of transportation in the U.S.

## FAA and Unmanned Aerial Systems (UAS)

With the introduction of unmanned aerial systems (UAS), the FAA has to ensure that the UAS do not endanger current users of the national airspace system (NAS) (including manned or other unmanned aircraft) nor compromise the safety of people and property on the ground.

The status of the UAS regulations can be looked at through two different eras. The first one is what preceded the provisions of the FAA Modernization and Reform Act of 2012 (P.L. 112-95), while the second one is what we are currently dealing with after the 2012 provision. In both eras, the FAA regulations on operating a UAS in NAS are very strict, and in fact, they prohibited civilians from flying UAS.

On July 30, 2013, the FAA issued a national policy (N 8900.227) to provide regulations necessary for reviewing and evaluating the safety and interoperability of proposed UAS flight operations conducted within the U.S. NAS. This document defines, in detail, the methods of the UAS operational approval through the issuance of either a certificate of authorization (COA) for public aircraft operations or a Special Airworthiness Certificate for civil operations.

## UAS Uses

The current policy is that no one may operate a UAS in the NAS without specific authority granted by the FAA. The FAA categorizes the operational use of UAS into four categories:

- 1. Recreational Use:** Limits the flying altitude of a UAS to 400 ft and is open to anyone operating UAS
  - For recreational reasons (as a hobbyist)
  - In a site that is of sufficient distance from populated areas
  - With avoidance of full-scale aircrafts and airports
- 2. Civil Use:** Limited to educational institutions and systems manufacturers who want to test fly systems. The authority here is the issuance of a special airworthiness certificate.
- 3. Public use:** Limited to public (i.e., governmental) agencies, including the DoD and law enforcement agencies. The authority here is represented by the issuance of a COA.
- 4. Commercial Use by Civilian:** Currently prohibited under any circumstances. Violators, if caught by the FAA, will be fined \$10,000.

## The Road Ahead

In the past year or so, the FAA has taken a giant steps toward fulfilling some of the mandates of its Modernization and Reform Act of 2012. The most important and obvious ones are the following:

- The publication of the “Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap,” in which the FAA provided their vision and important milestones for integrating UAS into the NAS.



- The selection of the six national sites for UAS testing under controlled environment (expected to be operational by mid 2014):
  - University of Alaska
  - State of Nevada
  - Griffiss International Airport (Rome, NY)
  - North Dakota Department of Commerce
  - Texas A&M University—Corpus Christi
  - Virginia Polytechnic Institute and State University (Virginia Tech)

The experience of operating civilian UAS within these sites as well as analysis of the flight results will help the FAA understand operational safety and requirements of civilian UAS and eventually help them determine the final rules and regulations as promised in the roadmap document.

## Obstacles Facing Commercial Operation of UAS

Some of the major hurdles to the FAA's allowance of civilian UAS operations in the NAS are the following:

- **The lack of sophisticated avionics instrumentation onboard of small UAS.** Due to the low cost, small size and light weight, it is difficult if not impossible to equip the UAS with the type of avionics and safety instruments that characterize the manned aircraft. FAA regulations are very strong on the need for "sense-and-avoid" capability in aircraft for circumstances when the visibility is hindered by a weather condition. Aircraft are required in some classes of the NAS to have the capabilities to operate under instrument flight rules (IFR). The FAA is struggling to come up with revised rules for the IFR to allow UAS operations analogous to manned aircraft using visual capabilities.
- **Privacy Issues:** Because they fly very low, a UAS with a mounted imaging sensor can collect very high-resolution imagery and intrude on the expected privacy of citizens, which has never been a concern for the FAA. With the introduction of UAS, the FAA has found itself responsible for finding ways to integrate it into the NAS without breaking the rules of privacy for ordinary citizens.

## UAS at Woolpert

We strongly believe in the potential of UAS in replacing manned aircraft in many geospatial data collection tasks. Based on this, we purchased our first UAS during 2013. Our UAS is a Nova Block III manufactured by Altavian of Gainesville, Florida. It carries a 29MP digital camera onboard and is equipped with GPS and an inertial measurement unit (IMU). The UAS has a wing span of 108 inches and flies up to 70 mph for as long as 90 minutes.



Woolpert UAS, Nova Block III



Sample image from Woolpert UAS (ground resolution is 2 cm, 0.79 in.)